TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

MARCH
1936

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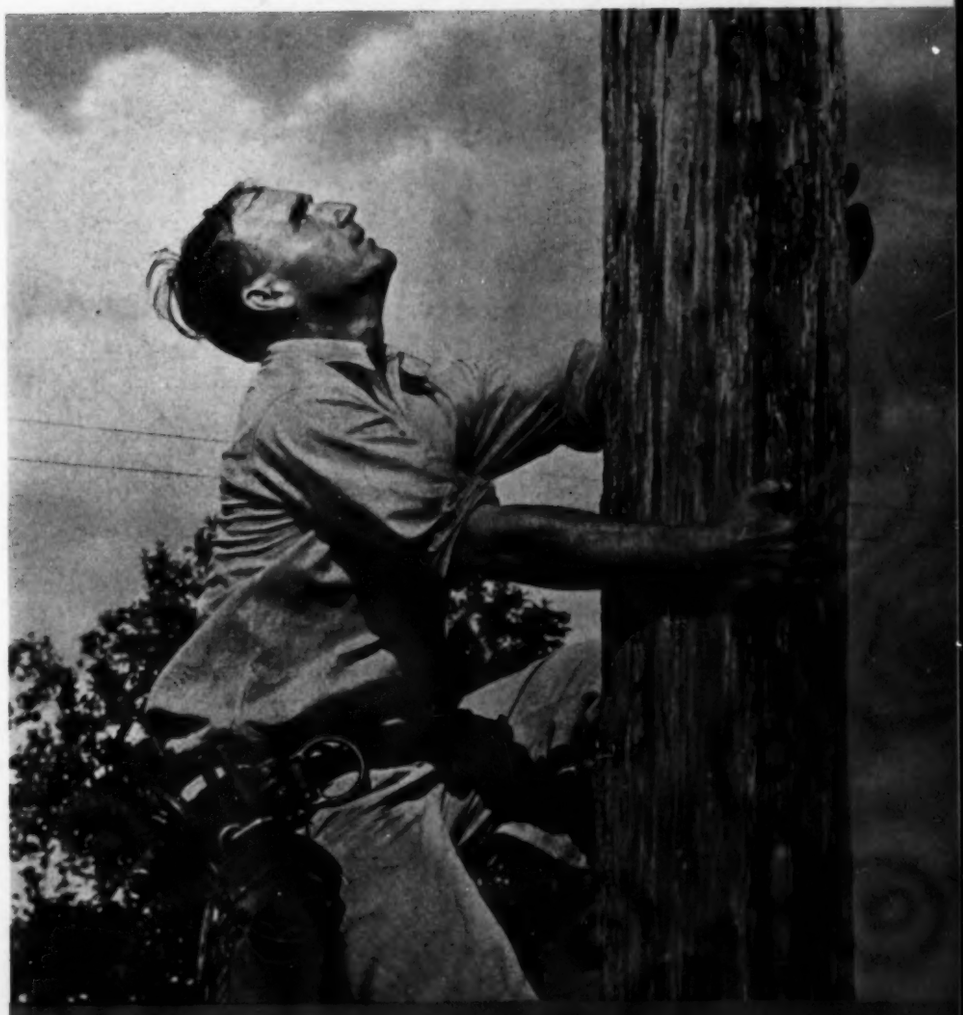

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- **Paid $104,000,000 in taxes.**
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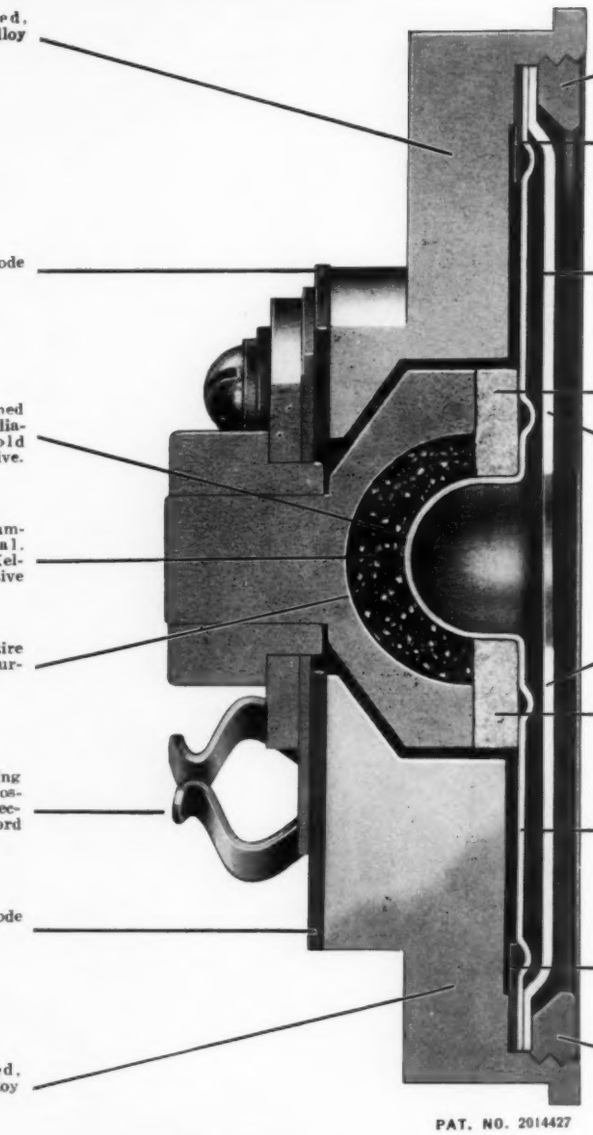

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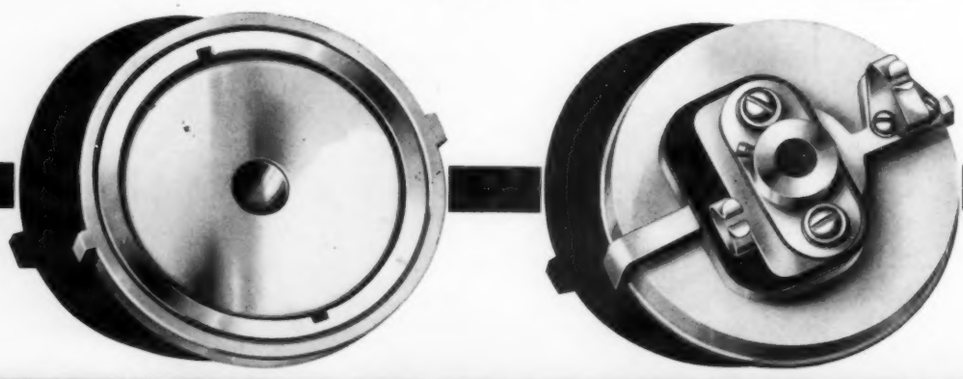

TELEPHONE ENGINEER
MANAGEMENT • ENGINEERING • MAINTENANCE

MARCH, 1936

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

● The Federal Communications Commission through Chairman Paul A. Walker of the Telephone Division called for the opening of the long-heralded hearings in the investigation of the American Telephone and Telegraph Co. and Bell System on March 17.

The hearings, which are expected to run at top speed for three and a half months between that date and July 1, are to have the objective of concentrating upon activities and phases of the American Telephone and Telegraph Co. and its immediate non-operating subsidiaries—Western Electric Co. and Bell Telephone Laboratories—which the FCC considers have never been fully probed by state commissions in their regulatory functons. Activities and records of Electrical Research Products, Inc., Western Electric which handles sound motion picture apparatus, will be an early feature of the hearings.

Commission Telephone Division officials and Chairman Paul A. Walker were naturally secretive in disclosing the objectives and program of their first hearings at the time TELEPHONE ENGINEER goes to press. It was indicated that American Telephone and Telegraph Co.'s relationships with their Bell System operating companies in financing operations might be an early subject with the cost of money to the parent company, interest charges made by the parent company to its subsidiaries, its investments and their reasonableness in subsidiaries, and terms of the intercompany license and service contracts as major themes. Another subject under scrutiny has been the resort to the courts by the Bell System in contesting rate regulation cases.

Chairman Walker indicated that manufacturing costs of Western Electric with a probability of handset telephones as a paramount issue, and cost of development and research through Bell Laboratories including the delving into the invention of non-telephonic apparatus would be two early subjects of probing at the proceedings. The Telephone Division head is anxious to complete several major phases of his Investigation by July 1 so that he can make a report to Congress on some of them before its adjournment. Commissioner Walker called upon President Roosevelt March 9 to explain the program of the investigation but would not disclose the purport of his conversation with the Chief Executive.

● Procedure of the telephone investigation hearings was announced as informal following generally the practice used by special congressional investigating committees. It was thought possible, however, a procedure similar to that of the Federal Trade Commission in its lengthy inquiry into power and gas utilities might be adopted. In the Federal Trade hearings the Commission witnesses presented their evidence and results of their investigative activities, then were cross-examined if any controversial points arose, and next utilities witnesses offered their rebuttal testimony which likewise met with cross-examination on controverted points.

Samuel Becker of Wisconsin, who formerly was executive counsel of Governor LaFollette, is the acting special counsel of the FCC investigation and its scheduled to conduct the examination for the Commission. Division Chairman Walker, together with his fellow division members, Vice Chairman Thad H. Brown and Commission Chairman Prall, will preside at the hearings.

Subpoenas were issued by Division Chairman Walker for the Commission for a number of leading American Telephone and Telegraph Co. officials to appear as witnesses at the first hearings.

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Seizure of Telegrams . . .

What may turn out to be a leading issue of the coming presidential campaign, the seizure of Western Union and Postal Telegraph telegrams and the records of telephone companies on long distance toll calls by the Senate Lobby Committee, with the "co-operation" of the FCC, has started the political cauldron in the National Capital boiling at its greatest fever heat of any subject yet injected into the election fight.

The Senate Lobby Committee, headed by Senator Black of Alabama, under two

resolutions of extremely broad power calling for an investigation of lobbying and political activities by corporations, groups and individuals last Fall issued blanket subpoenas upon the two telegraph companies to produce messages of lobbyists and groups urging legislation. At the same time it sought the co-operation of the FCC to probe into the sending of telegrams with unauthorized signatures to members of Congress, particularly by the electric power utilities in opposition to the Utility Holding Company Act. Toll call records of the telephone company also were sought by the senate committee to show the use of that medium by lobbying groups.

● The FCC directed its Telegraph Division to comply with the Senate Committee's request and, while Commission investigators were at work in the two telegraph companies offices in Washington probing unauthorized signatures on telegrams and any destruction of lobbying telegrams. Black committee probers were busy copying and gathering immense files of telegrams from all sections of the country and in the National Capitol. When the Black committee issued blanket subpoenas for telegrams of various large concerns, including the law firm of Silas Strawn of Chicago, former American Bar Association president and former head of the United States Chamber of Commerce, Western Union officials felt the time had come for advising their customers of such procedure. Upon letting the Strawn firm know of the action of the Senate body, a court test of the Senate committee's power was immediately started. Then in quick succession developments about the part played by the FCC in the telegram search were among those disclosed.

The controversy led to an attack on the FCC's alleged abuse of its legal authority over telegraph companies in the House of Representatives by Rep. Wadsworth, N. Y., Republican, joined by a trio of Democrats. Cochran of Missouri, May of Kentucky and Miller of Arkansas on March 4. Then on March 9, Senator Borah of Idaho, a leading Republican candidate for the presidential nomination, introduced a resolution, which was adopted within an hour by the Senate, calling upon the Commission "to report to the Senate all activities of its agents in any inspection or alleged seizures of telegrams and records and telephone communications or other private communications to or from any point in the United States or any forged or destroyed telegrams." The Commission was instructed to tell the Senate "by what authority and under what law and at whose direction" its action was taken.

● The FCC expected to transmit an early report to the Senate in response to this demand. Another report had been called for previously by Senator Couzens, Republican, Michigan, ranking minority member of the Senate Interstate Commerce committee, which handles communications legislation, asking the FCC to send to the senate all evidence which it gathered in connection with its report on the Willard Hotel conversation of upstate New York broadcasters during which talk of alleged bribery possibility of an unnamed Comissioner was mentioned. The FCC through a special five commissioner committee probed this conversation and found that purported bribery offers were completely without basis. Another investigation move still remains before the House Rules committee in the form of the resolution of Representative Connery, Massachusetts Democrat, who is seeking a sweeping inquiry into the broadcasting activities of the FCC.

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Coaxial Cable O. K. . . .

A satisfactory ending of the Commission's long study of the proposed experimental New York-Philadelphia installation of the Coaxial Cable by American Telephone and Telegraph Co. and New York Telephone Co. was culminated at the end of February.

A revised order authorizing the installation of the cable was issued by the Commission February 26 which eliminated most of the controverted restrictions in the previous FCC order of last August and at the same time reaffirmed the Federal agency's position to prevent any television monopoly to arise through the new invention. American Telephone and Telegraph Co. and New York Telephone Co. which had sought the experimental installation speedily accepted the FCC order two days later, and construction of the cable started immediately at the Western Electric plant at Point Breeze, Md. It is expected that the first test operations of the cable as far as telephone and telegraph possibilities—the Coxial Cable having the capacity for 240 simultaneous conversations—will commence within six months or towards the latter part of the summer.

● The Commission in its revised order held specifically that A. T. & T. should grant use to all television experimenters with standard equipment to test out the television transmission use of the cable and that no discrimination nor preference should exist in such test operations. This position had been cited time and again during the several days of hearings last July and during last November and January of this year by Dr. Frank B. Jewett, president, Bell Telephone Laboratories, and other A. T. & T. witnesses that the telephone company had no desire for a television monopoly and would grant use to all television experimenters and apparatus which came up to standards of the cable.

The new order of the Commission eliminated many drastic restrictions in its mandate of last August which had led to a rehearing before the federal agency last November and early in January. However, in the new authorized mandate the Commission ordered A. T. & T. to transmit construction and test progress reports and to send regular accounting reports on expenditure for the cable, at the same time stipulating costs during the experimental stages to be placed in suspense accounts and no fixing of capital or plants accounts to be made without FCC approval.

• ● •

Nebraska Depreciation Rate . . .

The United States Supreme Court without passing upon whether the 1934 composite 3½ per cent depreciation rate was arbitrary has upheld the right of the Nebraska State Railway Commission to impose this rate upon intrastate properties of the Northwestern Bell Telephone Co. The Supreme Court confined its decision to the basis of the right of the state commission to perform its regulatory function in regard to depreciation accounting because the Federal Commission had not yet acted upon the question of depreciation. At the time the case was brought into the courts, the function of fixing a depreciation rate had rested with the Interstate Commerce Commission and now has been turned over to the Communications Commission as part of its function.

● The Supreme Court held the state commission, because the Federal bodies had not yet acted, was completely justified in establishing the depreciation rate and further found that no due process in an unsatisfactory notice or hearing had been denied Northwestern Bell by the Nebraska commission. FCC Telephone Division Chairman Paul A. Walker in commenting upon the decision stated that the FCC was studying depreciation and when the proper time came would ask the state commissions to co-operate and aid in the formulation of the federal program of depreciation.

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Prall Reappointed . . .

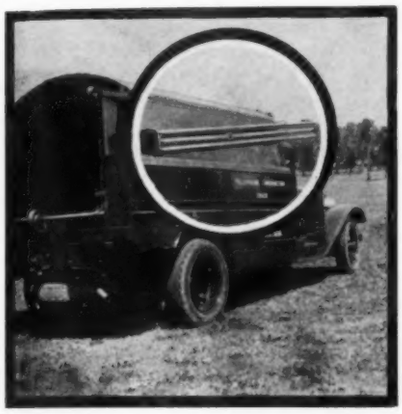
President Roosevelt reaffirmed his confidence in the regime of Commissioner Anning S. Prall by reappointing him March 11 to the chairmanship of the FCC. Chairman Prall, who thus will serve as FCC head for a second year, was a New York representative in congress for 12 years before being named to the Commission. His reappointment seemed to augur that Telegraph Division Vice Chairman George Henry

(Please turn to page 27)

Paint in Your Telephone Exchange

By RAY BLAIN

Paint is today playing a more important part in our daily lives than ever before. By this I mean from a point of comfort and utility rather than from an artistic sense.



Pike poles sanded and varnished.

Iron work and relay covers in switchboard all painted in aluminum.

• Spring is just around the corner, we hope, and "housecleaning" time as referred to in the old days will soon be here. A good spring going-over will not come amiss in the average telephone exchange and a small quantity of good paint, properly used will generally accomplish wonders.

Paint is today playing a more important part in our daily lives than ever before. By this I mean from a point of comfort and utility, rather than from an artistic sense. A large hospital recently made a series of tests to determine what colors reacted best to the comfort of their patients and found that buff walls with light cream ceiling was the most satisfactory. We have likewise decided that these colors are ideal for the interior of switchboard rooms, plant rooms and commercial offices in the average telephone exchange. This color is not dull, reflects light well and does not show dirt easily. We always use a good grade of gloss paint which adds much to the appearance of any room.

Most everyone will now agree that aluminum paint is ideal for all iron work such as main frames, relay racks and cable runways. This paint wears well, does not show dirt easily and greatly improves the appearance and lighting of the plant room. We are now using aluminum paint to cover the wood battery racks which support the sealed glass jar type storage battery and find it to be entirely satisfactory. In one exchange we recently painted the cable and walls in a cable vault with aluminum and have received many favorable comments on its appearance. Many will remember when black paint was considered necessary on all iron work and around the storage battery and no matter how often it was cleaned or repainted it always presented a dingy appearance.

Floor covering always has been a serious problem in the telephone exchange. We are of the opinion that brown battleship linoleum is the perfect floor covering for any telephone exchange. The first cost is high we admit, but it lasts almost indefinitely and when considered over a period of years, its cost is extremely low. The brown linoleum blends well with the wall colors mentioned above. Linoleum blocks of various colors are sometimes used and have the advantage that a single block, if damaged, can be easily and inexpensively replaced.

Concrete floors in plant rooms are sometimes painted and rubber strips

Main frame and relay rack painted in aluminum.

Cable vault, cable and walls painted in aluminum.

Storage battery rack painted in aluminum.

placed around where the most walking occurs. Only a good grade of floor paint should be used for this purpose as ordinary paint will not stand the wear. Sometimes rubber strips or linoleum is placed on wood floors in operating rooms where the chairs rest in front of the switchboard and where the supervisors walk, which makes a very neat arrangement providing the remainder of the floor is kept well finished. Floor paint when used on concrete is usually brown, gray or red in color. Paint closes the pores in concrete to a certain extent and prevents dust rising from it.

• A common mistake often made in painting the heat radiators in the exchange is the use of improper paint. In this connection heat reflection should not be confused with heat radiation. The heat from the sun's rays is reflected or thrown back by white paint, but heat carried by steam or hot water radiators for escape into rooms is thrown out or radiated. Tests have been made to determine the value of surface finishes as heat dissipators. Cast iron was used as a standard of 100 and light tint paint and enamels were found to be from 95 to 99 per cent efficient. Aluminum bronze radiated 72 per cent and copper bronze 76 per cent efficient. It has been proved that when a radiator was painted with a flake metal pigment such as aluminum, gold or bronze, its efficiency was reduced about 25 per cent. However, if it is painted right over the aluminum with enamel, the heat transmision is the same as when bare metal is used.

The U. S. Bureau of Standards states, "The effect of adding metallic paint (on a radiator) is equivalent to removing one-sixth of the radiator or nearly 17 per cent. Or as if one section out of six had been removed. Thus a radiator of five sections with white or other light color paint should be about as effective as another of six sections painted with metallic".

White paint is not usually desirable for heat radiators as it does not blend properly with the average room decorations. It is however, generally possible to use cream or ivory or some other light tint which presents a pleasing appearance and will not prove detrimental to heat radiation.

• Just as it is necessary to keep food products cool, we have come to realize that it is also sound economy to keep individuals cool also. The air conditioned theatre, restaurant, home and train have made their appearance and are no doubt here to stay. Experiments are now in progress on interior and exterior colors to determine which will tend to reduce the cost of cooling. In the future we are due to pay more attention to color schemes which will promote comfort as well as a pleasing effect to the eye. We wear light colored clothing in Summer because they look and feel cooler, which in reality, they are. White shoes are from five to 10 degrees cooler than dark ones. Black and other dark colors absorb heat and white reflects the heat rays. When the roof of a house is painted white the upstairs rooms will be considerably cooler, during the hot summer days.

It was also found that when the walls on the court of an apartment house were painted white that the heat was reflected back to the open air which caused the apartments facing the court to be several degrees cooler during the summer months. Added to this the apartments were lighter which reduced the amount of artificial lighting during the daylight hours.

White paint can not only be used around the exchange to advantage but may also be used on construction trucks, trouble cars and cable trailers to much better advantage than some colors now in common use. On first thought one may think that a line construction truck painted white would not present a pleasing appearance, just because we do not have many of them. Have you ever seen a large, spick and span, white milk truck, as it brings its load of liquid nourishment into the big city, truly a thing of beauty as well as utility. There is no doubt in my mind but that a white line construction truck would present an equally pleasing appearance.

• Highway departments in some states have their patrol cars painted all white and are well pleased with the result. A white car or truck is the most visible of any color on the road and in fact white is the greatest safety aid. White is necessary for safe night driving, and it is always in complete accord with the landscape and nature's colors during the day. Telephone line construction vehicles are often parked at the roadside for long periods of time while gangs are working, and painting them white should be a safety factor worth considering.

The expected life of tools is sometimes considerably reduced due to the lack of a small quantity of inexpensive paint. Personally we have never been in favor of painting ladders as it adds to their weight considerably. Linseed oil or hot paraffin may be used on them to good advantage. Some ladder manufacturers now use a moisture-proofing of the wood for their ladders which preserves them and maintains a pleasing appearance as well. Such tools as cable, pole jacks, chain hoists and other similar tools used in the open can be covered with aluminum paint as it provides both a pleasing appearance and adequate protection. On pike poles we paint the points and binding collars with aluminum and sand handles and then give them several coats of good weatherproof varnish. Shovel and spoon handles seldom need anything other than a rubbing with good oil occasionally.

Good paint is all inexpensive when the numerous advantages obtained from its proper use are considered,. A few gallons can generally be used around any telephone exchange in such a manner that it will prove a worthwhile investment.

CONVENTION SCHEDULE

Wisconsin State Telephone Association, Park Hotel, Madison, March 24, 25 and 26.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 7, 8 and 9.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 22 and 23.

Indiana Telephone Association, Claypool Hotel, Indianapolis, April 29 and 30.

Kansas Telephone Association, Hotel Sunflower, Abilene, May 12 and 13.

New York State Telephone Association, Syracuse, May 20 and 21.

Missouri Telephone Association, Kansas City, Hotel Muehlebach, May 27 and 28.

THE TELEPHONE IS A NECESSITY

The last fifty years has witnessed a phenomenal change in the world; it has affected all of us to such an extent as to revolutionize our very mode of existence. This is an era of machinery, of mechanical labor saving devices; an era where speed is an essential factor.

Of the many wonderful inventions that have been devised for our comfort and assistance perhaps there is none of greater service than the telephone. This instrument has given us a feeling of security. We know that in case of fire or of sudden illness the telephone is at our command to summon immediate assistance. In times of emergency lives may depend upon the speedy arrival of help, and the telephone frequently saves those few minutes that are so precious to us.

—Quenemo (Kan.) Enterprise

Telephone Transmission
Theory and Practice

By ROBERT A. CLARK, JR.

During numerous discussions with telephone men we have often discussed improved telephone transmission and the practical problems involved; this information and data will be passed on to readers of Telephone Engineer in a series of about 18 articles.

CHAPTER II

● The theory of alternating current is somewhat more involved than the direct current case discussed in Chapter I. However, in telephone calculations certain approximations simplify the equations so that they are little more difficult than those for direct current. Care must be used in applying the simplified equations so that errors will not result. I will try and point out the restrictions as we discuss the formulas so that you will be able to tell when and how the simplified formulas may be used.

As briefly discussed in Chapter I, alternating current or voltage starts from zero and as time goes on, rises to a given maximum value, decreases to zero, reverses polarity, rises to another given value in the reverse direction (which may or may not be the same value numerically as the first), and then decreases to zero from which point the sequence starts all over again. This is known as one cycle of operation.

The number of times the sequence repeats itself per unit of time is known as the **frequency.** For example, if the cycle is completed 10 times a minute the frequency is said to be 10 cycles per minute or if the cycle is completed 60 times a second the frequency is said to be 60 cycles per second. The frequencies encountered in telephone and telegraph operation range from around two cycles per second up to about 30,000 cycles per second. Typical examples are shown below.

Train dispatching selector impulses.. .....2-4 cycles.
Hand sending telegraph impulses... .....3-15 cycles.
Printing telegraph signals..... .....10-60 cycles.
Voice telephone transmission..... .....200-2000 cycles.
Carrier telephone and telegraph..... .....5,000-30,000 cycles.

● There is an infinite number of ways in which the rise and fall may take place. However, all cases may be simplified into combinations of what is known as **simple harmonic motion** or **sine waves.** An excellent example of simple harmonic motion is the movement of a pendulum such as on a grandfather's clock. It starts to the left, reaches the end of its travel, reverses direction, moves to the right, stops, reverses direction again, and moves to the left once more as the wheels go "round and round." Now if we wished to know the position of the pendulum throughout every instant of time during a cycle of operation as outlined above, we could fasten a small pen to the bottom of the pendulum and then move a piece of paper at a uniform speed along underneath in a direction perpendicular to the motion of the pen. The pen would then record on the paper a curve similar to that shown in Fig. 9. Such a curve is known as a **sine wave** and is the foundation of all alternating current theory. The term, **sine wave** is used in trigonometry, a branch of mathematics, which is so closely allied with alternating current theory that I believe it worth while for us to discuss briefly the derivation of the trigonometric terms and their application to electrical measurements.

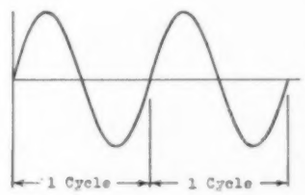


Fig. 9. Sine wave.

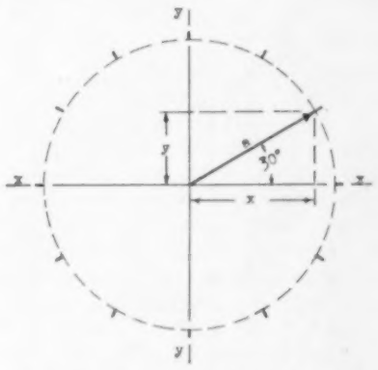


Fig. 10. Illustration of trigonometric functions.

Let us use for illustration, the face of a clock with the hour hand removed and the mechanism changed so that the minute hand moves backwards or counter-clockwise. Let us draw horizontal lines between the 15 minute marks preceding and following the hour; also a vertical line from the hour mark to the mark 30 minutes past the hour. We will call the horizontal line **x-x** and the vertical line **y-y**; in mathematics these are known as the **x** and **y** axes respectively. This assembly with the minute hand standing at 10 minutes past the hour is shown in Fig. 10.

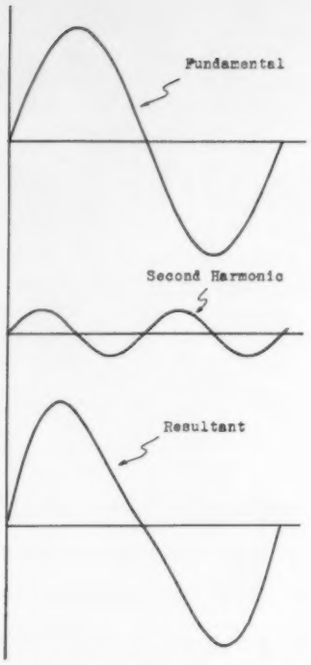


Fig. 11. Complex wave composed of fundamental and second harmonic.

● As you know, the angular distance around a circle is 360°; therefore each five-minute segment of the clock face represents 30°. Let us measure the distance from the **y-y** axis to the point of the minute hand and call it **x**, also the distance from the **x-x** axis and call it **y**. We will call the angle between the minute hand and the **x-x** axis θ (this is the Greek letter Theta). The length of the minute hand will be designated **a** and assume for this example that it is one foot. Now if we measure the distance **x** we will find that it is 0.866 feet, likewise **y** is 0.500 feet. The ratio **y** divided by **a** is known as the sine of the angle θ which in the illustration is 0.500 for the angle of 30°. Likewise the ratio **y** divided by **a** is known as the cosine of the angle θ and is 0.866. Another function which is of interest is the ratio **x** divided by **y**; this is known as the tangent of θ and for the above case is 0.500/0.856=0.577. There are three other trigonometric functions. i. e., secant, cosecant, and cotangent, but they are of little importance in electrical calculations. Elaborate tables have been prepared showing the values of the trigonometric functions for all angles; these may be found in any handbook of mathematics.[1]

Returning to the sine wave of Fig. 9, let us see how it evolves from the movement of the minute hand around the clock face. Assume that we have speeded up the minute hand so that it makes one complete revolution in 60 seconds or one minute. Starting at the 15-minute (past the hour) mark, the ratio y/a or the sine of Theta (abbreviated sine θ) is 0. As the hand moves around, the ratio or sine θ increases until when the hour point is reached 15 seconds later it is a maximum. At the end of 30 seconds, the ratio decreases to 0 (at 15 minutes to the hour), then changes sign and at the end of 45 seconds of travel reaches a maximum negative value (at half past the hour), and finally decreases to zero (at 15 minutes past the hour) thus completing the cycle of operation at the expiration of 60 seconds.

When these values are plotted against time we obtain the curve shown in Fig. 9 which represents two cycles of operation. If, as we assumed, the minute hand went around once in one minute the **frequency** would be one cycle per minute. We can readily demonstrate that the cosine curve as plotted against time is identical in shape to the sine curve, differing only in time or **phase relation**, i. e. when the sine curve is 0 the cosine curve is maximum.

● The entire theory of alternating current is based on the sine relation of amplitude versus time. As mentioned before the wave may rise and fall in any number of different ways but if the phenomena is recurring (repeats itself after a certain time interval) it can always be resolved into a combination of simple sine waves. This is a very important concept and I would like to illustrate by examples just what occurs when different combinations of waves are present.

When two or more pure sine waves are present we have what is known as a **complex wave**. It may be resolved (or divided into components) into a fundamental and its harmonics or multiples. We may have either even or odd multiples of the fundamental. Let me illustrate the above principles by three examples. The first, as shown by Fig. 11, illustrates the effect on the resultanf wave shape when a second harmonic having an amplitude equal to 20 per cent of the fundamental, is present. The presence of a third harmonic is illustrated in Figs. 12 and 13. These two figures show how the resultant wave shape will be materially altered merely by shifting the phase position of the third harmonic with respect to the fundamental. The phase position of the third harmonic in Fig. 13 is one-half cycle or 180° ahead (or behind) the position of the third harmonic shown in Fig. 12. In the first case we obtain a comparatively flat top wave and in the second case the wave is very peaked. The three illustrations represent typical cases of distortion due to the presence of over saturated iron in transformers or improperly adjusted vacuum tubes.

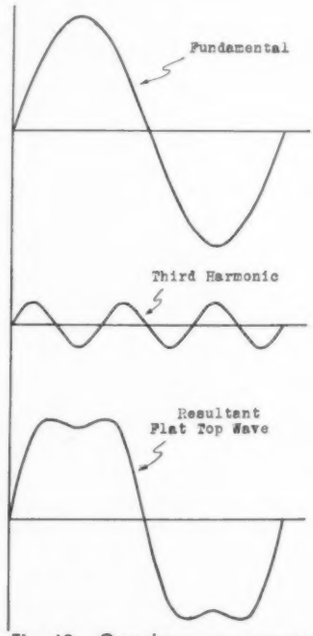


Fig. 12. Complex wave composed of fundamental and third harmonic, phase relations result in flat top wave.

The above discussion gives you a sketchy background of the basic sine wave theory on which alternating current calculations are based. A complete discussion of trigonometric relations and their application may be found in most college algebra books.[2]

● By means of the electron oscilloscope it is readily possible to observe and study the wave shape of alternating current and voltage. Oscilloscopes are comparatively inexpensive and may be purchased as cheaply as they can be made. For this reason I do not believe it worth while to describe the circuits of the apparatus at this time. The equipment on the market will reproduce a wave of any frequency from a few cycles per sec. up to 40 or 50 kilocycles. They have a sensitivity sufficient to give full scale deflection on an input of less than one volt. The oscilloscope is not of much use in the maintenance of telephone exchange equipment, however, it is very valuable in conenction with carrier telephone and telegraph operation.

Let us next consider the measurements of alternating currents and voltages. Like the meters used in d-c measurements, a-c instruments depend on current flow for indication. Due to the fact that alternating current may have endless values of harmonics in addition to the fundamental, we run into a difficult problem in defining what one ampere of alternating current is. So we resort to the equation for the relation between power developed in a resistor through which

current is passing. This relation was expressed by equation (4) in Chapter I, and is $P=I^2R$, where P is the power in watts, **I** is the current in amperes and **R** is the resistance in ohms. Now power, which is in the form of heat, can be measured precisely regardless of the wave shape or whether the current is alternating or direct. So if we define the unit of alternating current so that one ampere will always produce the same heating effect when flowing through a given resistance we will have a standard which will be suitable for either direct current or alternating current regardless of wave shape or frequency.

● This unit is known as **root-mean-square current** abbreviated r. m. s. If the wave shape is known the r. m. s. value can be computed. For a **pure sine wave** (containing no harmonics) the r. m. s. value is equal to 0.707 times the maximum or instantaneous peak value. The r. m. s. value of alternating current or voltage is the only true expression and any form of meter for exact measurements irrespective of wave shape and frequency must operate on a heat basis. The thermocouple meter meets these requirements and is therefore highly satisfactory where extreme accuracy is necessary. However, it has several limitations such as low sensitivity, small overload capacity and high cost which tend to prevent its wide-spread use. The better grade instruments have a sensitivity of about 15 ohms per volt full scale deflection. This is comparatively low and prohibits the use of such an instrument in many telephone applications. The thermocouple type of meter consists of a thermocouple connected to a sensitive D'Arsonval type d-c galvanometer. The thermocouple is surrounded by a small heater resistance which in turn is connected to the a-c source being measured. Current in the heater (either a-c or d-c) generates d-c potential in the thermocouple which in turn causes a deflection of the meter needles. By employing the same principles as used for d-c measurements the thermocouple meter can be used to measure either voltage or current. This was fully discussed in Chapter I and need not be given further consideration here. If you have a thermocouple meter you can design resistance networks by means of equations (2) and (9) so that either voltage or current can be measured.

A few years ago the copper-oxide rectifier was developed to the point where it would rectify extremely small currents. A meter utilizing such a rectifier provides sensitivity comparable to the d-c instruments. However, it too has several limitations. One is that the meter does not indicate true r. m. s. current. This would not be serious if we were measuring only pure sine waves because then we could obtain a correct r. m. s. reading by calibration with a thermocouple instrument. When, as in most telephone measurements the wave shape is more or less complex, there may be considerable difference between the true r. m. s. value and the rectifier meter reading, which is generally calibrated to indicate true r. m. s. values for a pure sine wave only. On complex wave measurements the error may be as much as 10 per cent.

The rectifier type instruments have a decided frequency characteristic and become less and less sensitive as the frequency increases. Another characteristic of the rectifier is its non-linear rectifying properties, the efficiency of rectification decreasing materially at low currents. In addition to the decreased efficiency at low currents the resistance of the rectifier increases materially; this further tends to reduce the sensitivity at low current values.

● However, in spite of these apparent defects the rectifier instrument is very satisfactory for a-c measurements in the telephone plant. It is rugged and will stand appreciable overloads without damage. Calibration charts can be prepared to correct for frequency errors and the wave shape error can be disregarded in most cases.

The connections for using a rectifier with the meter described in Chapter I

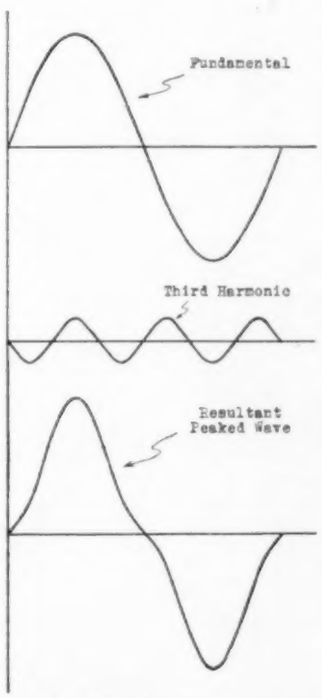


Fig. 13. Complex wave composed of fundamental and third harmonic, phase relations result in peaked wave.

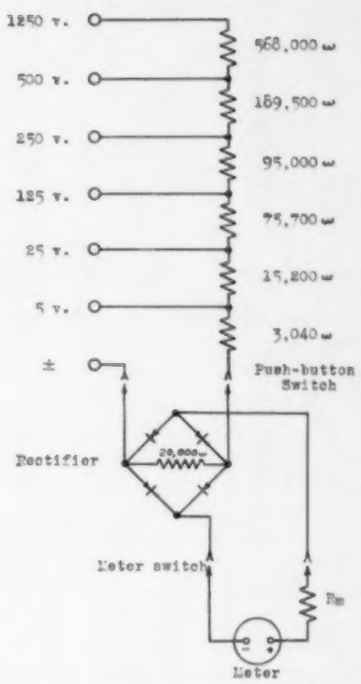


Fig. 14. A-C voltmeter circuit.

are shown in Fig. 14. The resistance values are based on an average rectifier resistance of approximately 750 ohms, and a current for full scale meter deflection of 1.32 ma. As rectifiers vary appreciably, some of the resistors may require slight readjustments. However, as I pointed out before, the precision of this type of meter is not high and the best plan is to prepare calibration curves for conditions most commonly used.

In order that you may have some idea as to the properties of rectifiers I have prepared the curves shown in Figs. 15 to 18 which show typical characteristics.

Data is presented on three rectifiers which are representative of the best obtainable as well as the cheaper units. I have identified the units by serial numbers, which practice will be followed throughout the series of articles whenever tests or descriptions of equipment is presented. If you wish more information on any of the items you may obtain the same by writing TELEPHONE ENGINEER.

The No. 1 unit is a combination of rectifier with a microammeter. The meter is calibrated to read 0.2 ma or 200 microamperes a-c at full scale deflection on low frequencies, such as 60-cycle. This rectifier is probably the most efficient and uniform with respect to frequency that can be obtained at the present time. Fig. 15 shows the resistance and 60-cycle voltage calibration versus scale reading. You will observe the rapid rise in resistance at

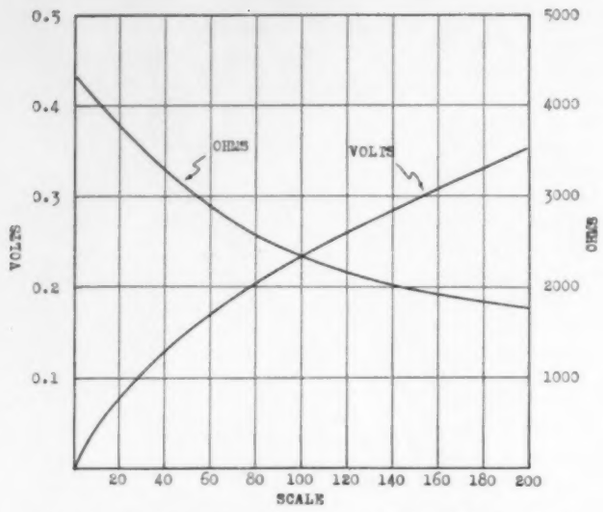


Fig. 15. Unit No. 1, voltage and resistance calibration of a 200 microampere rectifier type A-C meter.

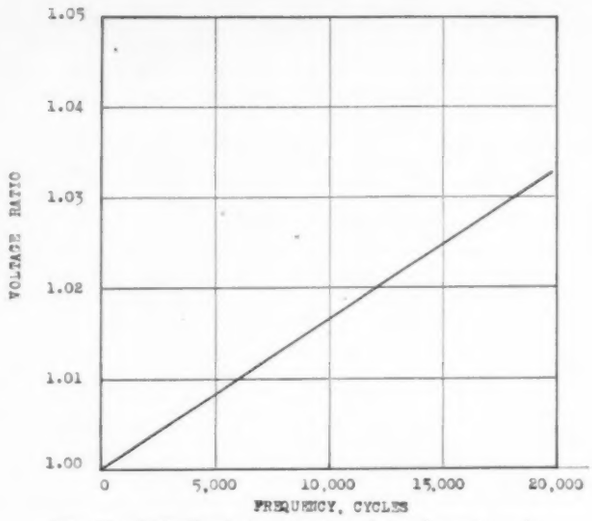


Fig. 16. Unit No. 1, increase in voltage for unit scale deflection with frequency.

the low scale deflections. This results in a non-linear relation between the voltage and scale reading of microamperes which is approximately uniform as in a d-c meter. The fact that the meter resistance does not remain constant introduces a difficulty in designing the series resistors for multipliers as shown in Fig. 14. A compromise must therefore be made assuming an average value for the meter resistance.

The reduction in efficiency of the rectifier as the frequency increases is shown in Fig. 16. The curve shows the ration of the voltage at any frequency to that required at 60 cycles for a given meter deflection. For example the voltage necessary to give full scale deflection at 10,000 cycles is about 1.7 per cent greater than the 60-cycle voltage. The characteristics of the two other rectifier units with respect to impressed voltage and rectifier resistance are shown in Fig. 17. The decrease in sensitivity with frequency is shown in Fig. 18. You will note the great variation in rectifiers, and for this reason the characteristics must be known in order to obtain any degree of accuracy in meter readings.

● The one mil d-c meter described in Chapter I is entirely suitable for measurements of 60-cycle voltages commonly used in telephone plants. However, for telephone and carrier frequency voltages the microammeter described above is more practicable. A d-c meter of 0.5 ma. together with a good rectifier is suitable for most telephone measurements. This combination produces an instrument having a sensitivity of about 1000 ohms per volt a-c. The application of the rectifier voltmeter in telephone transmission and other measurements will be more fully discussed in a subsequent article.

There is little use for an a-c milliammeter in telephone measurements except occasionally for 60-cycle tests. On account of their comparatively high resistance, the rectifiers described above are not entirely suitable for current measurements. However, rectifiers are available which in combination with d-c meters having about 20 ma. full scale make quite satisfactory milliammeters for a-c measurements.

Bibliography

1. A Manual of Mathematics, Hudson and Lipka. Order through TELEPHONE ENGINEER.
2. Trigonometry For the Practical Man, J. E. Thompson. Order through TELEPHONE ENGINEER.

Symbols

r. m. s.—Root Mean Square.

cycle—Abbreviation of "cycles per second."

θ—Theta, symbol for angle.

(TO BE CONTINUED)

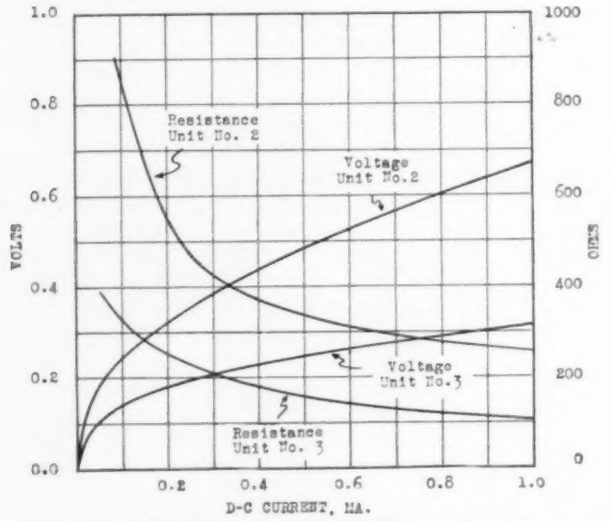


Fig. 17. Units No. 2 and No. 3, voltage and resistance characteristics of meter-type rectifier units; tested with a 50-ohm d-c milliameter.

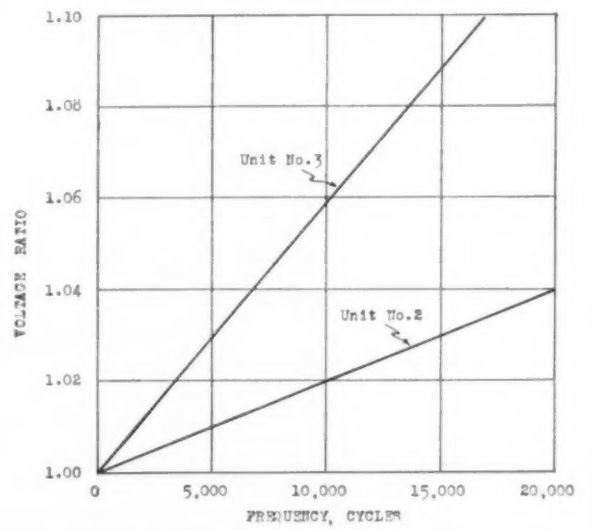


Fig. 18. Units No. 2 and No. 3 increase in voltage for unit scale deflection with frequency.

Editorial « « «

Constitution Sidetracked In Communication Seizure

● We happen to be one of the millions of radio listeners who consider Boake Carter the ablest news commentator on the air today. Mr. Carter, featured on the Philco program every evening at 7:45 E. S. T., is one of the few (if not the only) commentators whose broadcasts are not censored by the sponsors. Because of this admirable policy he is able to give facts and his unbiased opinions regardless of whose toes he might be stepping on.

The present onslaught against the Black lobby committee for its "snooping" on individuals, corporations and associations opposed to the New Deal (see page 22), in which it is reported that the Federal Communications Commission made copies of telegrams of these groups on file in Western Union and Postal Telegraph offices and turned them over to the Black committee, brings to our mind one broadcast Mr. Carter made during the promotion of the utility holding company bill in Congress, when holding company interests were ruthlessly attacked by sponsors of the bill for opposing it.

On February 28, 1935 Mr. Carter said:

"Quite apart from the question of whether holding companies are insidious blots on the economic life of the nation, or not, a point not labored here—since when has it become wrong to stand up for one's own interests and welfare? Can it be that the sponsors of the bill to abolish holding companies expected that the objects of their wrath would sit still and twiddle their thumbs, play tiddly-winks and be satisfied with the role of congressional punch bag and remain silent, while measures were being prepared to put them out of business? Usually in a fight—especially one where it is a matter of existence or no existence to one of the fighters—both combatants have at each other with all the tricks at their command.

"Surely we have not reached the stage of American life, where the man with all the weapons in his hand insists that his opponent shall be bound and gagged, that he may hit him easier. . . .

"Who (Wheeler-Rayburn bill sponsors or utility holding companies) is right we do not pretend to say—but one does say that the holding company interests are entitled to try and get their story over without being bawled out for so doing. . . . And we for one decline to subscribe to the new fangled notion that it is progress to wallop a man in the nose, and then denounce him as a blackguard because he pokes you in the nose by way of return."

We subscribe to Mr. Carter's views and it seems Senator Black is in the same class with the Wheeler-Rayburn bill sponsors as he has charged the individuals and organizations his committee is harrassing with spreading propaganda and misrepresentation of facts and is really irritated to think that they would fight to protect themselves—an old tradition and characteristic of full-blooded and freedom-loving Americans.

● At this writing it has been disclosed that in addition to its "grab" of telegraphic correspondence, the Black committee also has obtained records of many long distance telephone calls made between Washington and other cities. It is said that the committee has the dates of the calls, names of persons talking and length of the conversations. Present information does not indicate whether the FCC played a part in obtaining this data.

There is no doubt that if this wholesale violation of the American Bill of Rights which gives the people the right to "be secure in their persons, houses, papers and effects against unreasonable searches and seizures" continues the Black committee, the FCC and the New Deal itself will have to face a lot more criticism and opposition from the public than they have experienced thus far.

ANNOUNCEMENT

TELEPHONE ENGINEER is now $1.00 a year instead of $2.00 and $2.00 for three years instead of $5.00.

This change in price is due to the fact that for almost a year we have been doing without the services of subscription agency salesmen whose compensation virtually required us to hold to the $2.00 and $5.00 rates.

These agency men caused us no end of trouble with their promises of publicity, premiums and cut rates for "renewal" subscriptions that never reached our office, which was brought to our attention only when we started doing business with the industry by mail.

We believe the best way to eliminate the pests who are causing this trouble is to lower our subscription rates, eliminate the commission paid to circulation men, and do business with you by mail and direct contact.

If you feel this is a sensitive decision and want to help us eliminate this trouble we ask that you support TELEPHONE ENGINEER in its stand by transacting all subscription matters by mail.

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TELEPHONE ENGINEER

FCC Charged With Telegram "Seizure" for Black Group

Congressmen assail communications commission declaring that it "seized" correspondence passing between private citizens without any warrant or authority

BULLETIN

A new legal action against the Black senate lobby committee, designed to protect messages of a confidential nature was instituted in the District of Columbia Supreme Court March 12 by William Randolph Hearst, publisher. Mr. Hearst charges that the alleged telegram "seizure" by the Black committee and the Federal Communications Commission included one from him to James T. Williams, Jr., Washington editorial writer, relating to the preparation of a series of editorials.

Mr. Hearst, through attorney Elisha Hanson, has petitioned the court to compel the Black committee and the FCC to return private telegrams "seized" in their wholesale foray.

The publisher asked the court to order the five senate investigators and the seven FCC commissioners to appear and answer his charges that the "seizure" of private correspondence violates constitutional rights.

The American Newspaper Publishers' Association is reported to have filed an affidavit in support of the Hearst suit and by resolution condemned the Black committee and the FCC and pledged assistance of its 438 newspaper members, representing more than 80 per cent of national newspaper circulation, to its members so attacked.

BULLETIN

As this issue of TELEPHONE ENGINEER goes to press the Supreme Court of the District of Columbia (on March 11) halted the Black lobby committee's "seizure" of telegrams sent and received by opponents of the New Deal as a violation of the Bill of Rights protecting citizens from "unreasonable searches and seizures."

Chief Justice Alfred A. Wheat granted a permanent injunction restraining the Western Union Telegraph Co. from delivering to the Black committee the telegrams sent and received by Winston, Strawn & Shaw, Chicago law firm, which appealed to the courts for protection.

BULLETIN

The Senate on March 9 adopted a resolution by Senator William E. Borah (Rep. Idaho) calling upon the Federal Communications Commission for a full report of its "alleged seizures" of private telegrams for the Black lobby committee.

The adoption of this resolution was followed by an attack upon the activities of the Black committee by Senator Frederick Steiwer (Rep. Ore.), who charged that the lobby investigation was not only political in nature, but contended the rights of citizens under the Bill of Rights are being violated.

In his attack on the committee, Senator Steiwer stated that he had received a call in which he was told that the committee knew that Postmaster Farley had lobbied on the utility holding company bill, but it refrained from asking the telegraph companies to furnish Mr. Farley's telegrams.

Senator Black for the second time denied that the FCC has turned over millions of telegrams to his committee.

BULLETIN

While the dispute was raging about the Black lobby committee's wholesale "seizure" of telegraphic correspondence of individuals, corporations and associations opposed to the New Deal, it was disclosed that the committee also had obtained records of many long distance telephone calls made between Washington and other cities.

It is alleged that Senator Black has the dates of the calls, names of persons talking and length of conversations. It is charged that this data was subpoened to supplement the committee's examination of some 5,000,000 telegraphic messages. At this writing it had not been disclosed whether the Federal Communications Commission participated in obtaining the data on the telephone calls.

● According to reports the Federal Communications Commission is involved in the activities of Senator Hugo L. Black's (Dem. Ala.) lobby committee, which has caused a considerable uproar in the country by its harassment of individuals and associations opposed to the New Deal.

The most recent attack on Senator Black's committee was by the law firm of Winston, Strawn and Shaw of Chicago, when the committee endeavored to get the Western Union and Postal Telegraph Companies to turn over to it the telegraphic communications of the Chicago law firm.

Winston, Strawn and Shaw obtained a temporary restraining order against the Western Union Telegraph Co. complying with the Black committee's request and a hearing was scheduled for March 11.

● There were developments in the lobbying situation in which the FCC was reported to be active. These developments included:

1. Disclosure that the Federal Communications Commission, which has jurisdiction over telegraph companies, has "seized" millions of telegrams from the Western Union and Postal Telegraph companies and turned them over to the Black committee.

2. Disclosure that A. G. Patterson, director of telephone for the communications commission, is a relative of Senator Black's wife, and was orignally brought here from Alabama by Senator Black to help conduct his air mail investigation.

3. An attack on the communications commission in the house, where both Republicans and Democrats accused

(Please turn to page 27)

FCC Charged With Telegram Seizure

(Continued from page 22)

that agency of violating not only its statutory authority but the fourth amendment of the constitution which prohibits unreasonable searches and seizures.

● It was learned that the Federal Communications Commission has made mass "seizures" of the telegraphic correspondence of more than a thousand individuals, corporations, law firms and prominent individuals opposed to the policies of the New Deal, all of which are in the hands of the Black inquisitors. The FCC "seized" more than 15,000 telegrams from the Washington office of the Western Union company alone. Other "seizures" made throughout the country both by the FCC and under subpoena by the Black committee, have brought the total of telegrams now in hand to more than 5,000,000.

Although Senator Black categorically denied that the FCC had cooperated with his committee, it was learned from unimpeachable sources that such cooperation was obtained last August when the telegraph companies refused to comply with a so-called "blanket" subpoena from the Black committee calling for all telegrams sent or received which might relate in any way to lobbying. The telegraph companies complained that such a subpoena was unreasonable and that compliance with it would be a violation of the law. The Black committee thereupon called upon the communications commission, which is authorized by law to examine the books of communications companies, but not, lawyers declare, to seize private correspondence.

● After the telegraph companies had refused to comply with the blanket subpoena and the communications commission was put to work, the Black committee also resorted to individual subpoenas, which likewise were sweeping in character. The subpoena in the Winston, Strawn & Shaw suit, it was learned, called for "All telegrams sent paid or received collect between the dates of Feb. 1 and Dec. 1, 1935, and charged to Winston, Strawn & Shaw, First National Bank building, Chicago, Ill., and all of its associates and subsidiaries, and all of their known employes and agents."

Justice Adkins of the District Supreme court granted the continuance in the suit brought by Attorney Silas H. Strawn to enjoin the Western Union company from turning over the law firm's telegrams at the request of Attorney Paul Lesh, representing Western Union.

"We are in the position of a stakeholder," Lesh said. "We simply seek a ruling. We do not wish to give up the telegrams unlawfully, nor do we wish to obstruct the committee."

● Before this announcement was made, Senator Black had stated that it would not be necessary for his committee to be represented as a "friend of the court" because the company would request a continuance.

Senator Black refused to comment when asked whether he had a relative on the communications commission.

The activities of the FCC in assisting the Black committee's inquisition were assailed on the floor of the house by Representative James W. Wadsworth (Rep., N. Y.), while Representatives John J. Cochran of Missouri and Andrew J. May of Kentucky, both Democrats, joined in the denunciation.

Representative Wadsworth declared that "tens of thousands of telegrams passing between private citizens" had been seized without any warrant or authority.

Mr. Wadsworth declared that the act creating the FCC, passed in 1934, authorized the commission to inspect the records of the telegraph companies but that congress "never intended to clothe any government commission with the power of search and seisure." He added that under decisions of the Supreme court congress has no power to conduct "fishing expeditions."

In a violent denouncement on the senate floor of the reports that his committee was using terroristic methods, Senator Black on March 5, on the senate floor upheld the committee's activities and was reported to have even defied the federal courts to interfere with his activities.

In his denouncement Senator Black denied that his committee employed the FCC to make copies of telegrams on file with the telegraph companies, over which it has regulatory jurisdiction. It is alleged that reports that the FCC was involved in the telegram "seizure" have been substantiated by officials of federal and private agencies.

At this writing it is reported that FCC Chairman Anning S. Prall stated that he did not know whether or not FCC employees had copied telegrams for the Black committee, but said he understood that the commission's Telegraph Division had aided the senate committee. Telegraph Division Chairman Stewart is said to have neither denied or affirmed FCC participation. Also Telephone Director Patterson has denied that he had any connection with the FCC telegram "seizure" activities.

"Tapping In" on Washington

(Continued from page 14)

Payne, a New York Progressive Republican, would not be renamed by the President when his term expires July 1.

• • •

Refutes FCC Jurisdiction . . .

● The Rochester (N. Y.) Telephone Corp. is not under Federal jurisdiction either on the score of alleged financial control by the New York Telephone Co. or because of the circuits which it furnished to the local broadcasting stations for broadcast program transmission, a brief filed by the company's counsel, T. Carl Nixon, with the FCC in reply to Commission allegations, states.

The physical circuits for broadcast programs from the radio were declared in the brief to be "intrastate in character" as the only facilities furnished by the Rochester Telephone Corp. to the two local broadcasting stations are the circuits running from the studios to the transmitters or from certain "spot locations" in the metropolitan district of Rochester to the studios, the circuits in each case being wholly within the state of New York.

"We have reached the conclusion that the Federal Communications Commission has no jurisdiction over the rates charged by the Rochester Telephone Corporation for the circuits leased to the local broadcasting companies," the brief stated. It was noted that the Communications Act treats radio and wire communications as two classes with different impulses, one over a wire and the other through the ether. The broadcasting company uses its own facilities for the radio communication, the brief continued, and a combination of its own facilities and leased wires for the wire communication, "but it is the broadcasting company which engages in both kinds of communication."

The mere leasing of pairs of wires without any electrical impulse is not an incidental part of radio transmission, the brief said, "certainly not sufficiently incidental to justify regulation on the ground that furnishing of such wires is incidental to interstate communication." If the FCC holds mere furnishing of bare wires without electrical impulse is a service "incidental" to communications by radio under the Communications Act, the brief stressed, "it must also hold that commercial electric light and power companies which furnish the power to the broadcasting stations are also included within the control of the Commission." The brief added that this application might also get under FCC regulation the railroads which bring equipment to the broadcasting station, the coal used at the station, for power production or bus lines which transport station employees between studio and transmitter, which would lead to ridiculous interpretation of the act and make it of doubtful constitutionality.

The brief pointed out that none of the Rochester circuits went through the tele-

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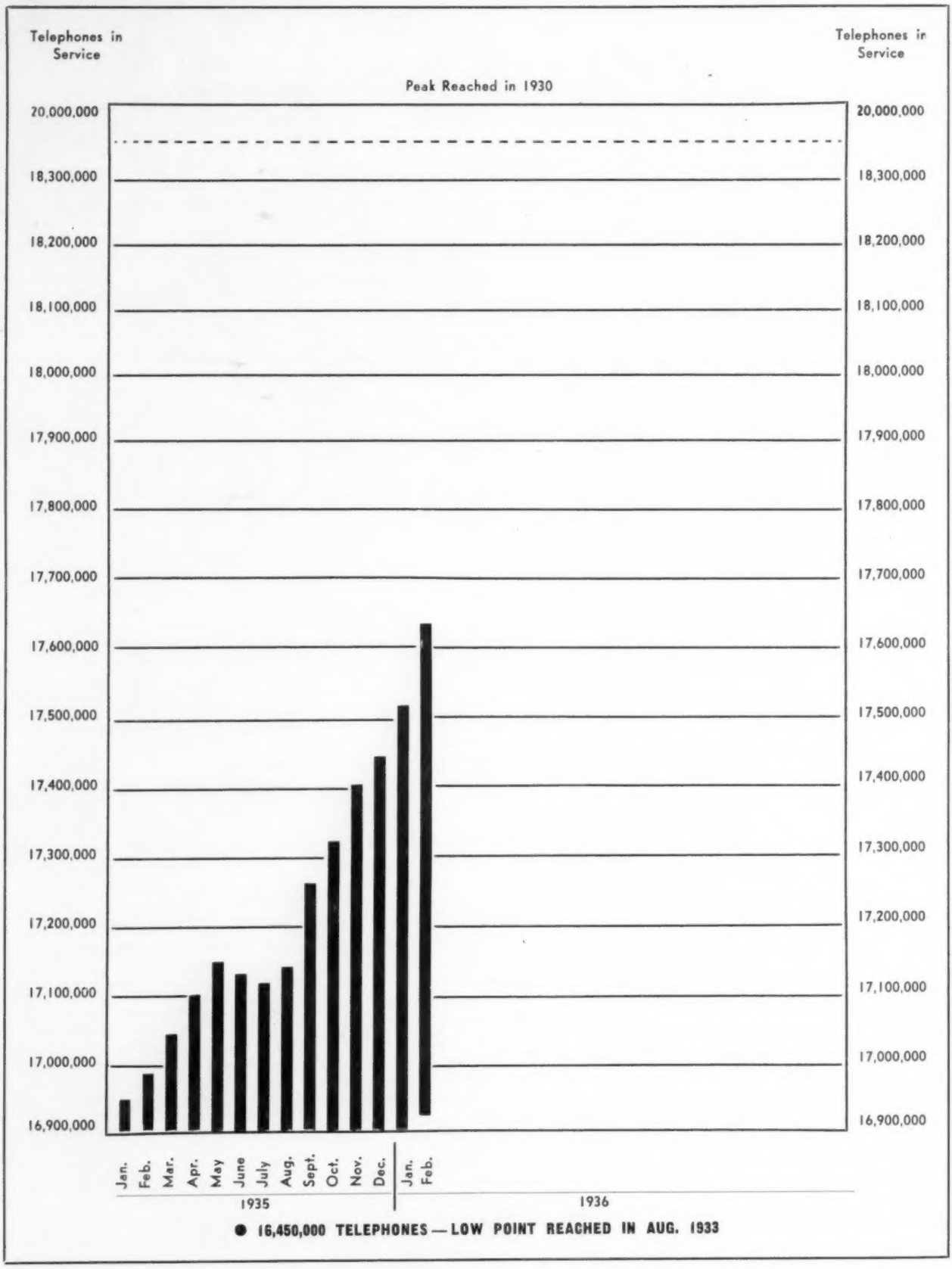
Monthly Telephone Station Barometer



FCC Asks for More Monthly Reports

In a release dated February 15, the Federal Communications Commission made the following statement:

"The Telephone Division approved the form letter suggested by the Accounting Department requesting all telephone carriers having average annual operating revenue in excess of $250,000.00 to file monthly reports of revenues, expenses, and capital changes, commencing with January, 1936."

In a letter sent to members having over $250,000 annual revenues on February 24, President F. B. MacKennon, United States Independent Telephone Association, advised them to comply with the request. The letter in part follows:

"We believe it is very essential for the welfare of the telephone industry, in cooperation with the Federal Communications Commission to maintain comparable statistics of the industry, and therefore that all of our companies should respond promptly to this request from the Commission. It is of value to the company to make such a monthly report and it is of value to the Association to have such a report made, and, as the Commission has said, it is desirable to have the information available for various groups interested in the progress of the telephone industry.

"Of course, only those companies fully subject to the Commission are required to make this report. From the others it is voluntary. We hope you will cooperate in this matter. Please advise us upon receipt of this letter whether you have received the circular letter and report forms from the Commission; also please advise us whether your company will comply with the Commission's request and file the monthly report."

Transfer Approved

Transfer of various telephone properties of the Utilities Company, Inc., to the Northern Telephone Co., to be operated by M. H. Roseland, DuPre., S. D., has been approved by the North Dakota Board of Railroad Commissioners. Roseland will make his headquarters at Drayton, N. D.

$10,000 Improvement

The Northern Ohio Telephone Co., Bellevue, O. is replacing all wires and poles in the Radnor exchange area of the company which will cost between $7,000 and $10,000.

More than 75,000,000 telephone calls are made every day in the United States.

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The first to produce a successful vibrating type ringing converter to operate from alternating current.

Fig. 1. Hole 18 inches deep is dug around pole. Increment borings are taken. Outer decayed surface is removed and pole is thoroughly cleaned.

Fig. 2. Apply preservative compound with brush uniformly. Compound is applied extra heavily over cracks and badly decayed spots.

Preservative Treatment for Standing Poles

By DAN KAMPHAUSEN
Vice President
OSMOSE CORP. OF AMERICA

● That part of a standing pole subject to the most strain is also most susceptible to insect damage and decay.

Decay in wood is caused by living organism known as fungi, low parasitic forms of plant life. For growth and propagation rot-producing fungi require food, which consists of the wood itself, moisture, air and favorable temperature.

Over a period during each year, most standing poles have present at the ground line all of the requisites that

(Please turn to page 32)

Fig. 3. A water proof bandage is wound tightly around pole. Tacks are applied to the first and last layers.

Fig. 4. The hole is then backfilled. This completes entire operation of the preservative treatment for standing poles.

"Tapping In" on Washington

(Continued from page 27)

phone company's switchboard, the telephone company furnishes no electrical energy for the transmission of sounds over them, it makes no use of them itself, it furnishes no battery or energy, it has no means of connecting these circuits to its telephone system and "they are merely dead wires". The telephone company, it added, had nothing to do with the circuits except to keep them in repair and the inspection is done by the broadcasting company. For nationwide broadcasts the Rochester company leases circuits to the New York Telephone Co. and no part in the transmission is taken, the circuits being connected with those of the New York company.

The Supreme Court has held that the mere leasing of facilities, the brief cited, to an interstate carrier does not subject the lessor to Federal regulation even if the facilities leased are essential to the performance of its duties by the carrier.

Noting that the courts have uniformly held ownership of a majority of voting stock gives stock control of the corporation, the brief stressed that the New York Telephone Co. neither directs nor has the power to restrain the acts of the Rochester Telephone Corp. and is not controlling the latter carrier in any sense of the word. The New York Telephone Co. does not either affirmatively exercise control and has no power to exercise it and the brief noted Congress intended the controlling company should not only have the power but affirmatively exercise it. The voting trust agreement which retained control in Rochester men was cited as to bar any one with Bell System connections. The veto power of the New York Telephone Co. in its preferred stock on financing was nil because of the large amount of unissued stocks and bonds already authorized and any such control was a matter of "the indefinite and possible future". The New York Telephone Co. toll switchboard in the Rochester office was economical, efficient and practical and did not affect most of the intraterritorial calls of the Rochester company.

Sales Tax to High Court

The fight of the Illinois Bell Telephone Co. to avoid payment of the state sales tax has been carried to the Illinois Supreme Court.

Huts built on lofty Mount Elbruz in the Ukraine have been linked by telephone, the highest being at 18,868 feet, and in stringing the 65 miles of wire some poles had to be carried up the steep mountain by men.

Because you have wanted ONE anchor that will grip in all soils, under all conditions . . . we designed MASTER-GRIP . . . much easier to install . . . more economical . . . the most efficient guy anchor ever made!

Quickly Installed . . . Positive . . . Lasting

MASTERGRIP drives into place quickly, at any angle, into hard, medium, sandy or swampy soil. It is equally dependable installed under water. A hammer and steel tube are the only tools needed. Under moderate strain each blade opens independently and freely into undisturbed soil. MASTERGRIP eliminates digging, filling and tamping . . . assures positive, solid anchorage. Installation is *quick . . . easy . . . economical!*

MASTERGRIP is constructed simply. Its few rugged parts are made of malleable iron, according to A. S. T. M. Grade No. 32,510. Strong and durable, MASTERGRIP is built to give years of dependable service.

For full information write your jobber or

THE AIKEN
MASTERGRIP
ANCHOR CO., INC.
Calumet Building Saint Louis

Preservative Treatment For Standing Poles

(Continued from page 30)

are necessary for fungus growth.

Millions of fungus spore floating in air settle and lodge in crevices and cracks in poles. They germinate rapidly, emitting destructive filaments which ultimately destory the pole.

Untreated poles and a surprisingly large percent of poles treated with a preservative before installation, after eight or ten years upon inspection appear to be structurally sound, however, upon careful inspection are found to be decaying. On treated poles the preservative used prevented attack from the outside but by using cracks as entrances fungus spore have carried out their destruction from within, leaving nothing but a hollow shell.

● A method of treating standing poles, to arrest and prevent decay at the ground line was recently used by the New York State Electric and Gas Corp. at Lancaster, New York. The process used combines inorganic and organic salts of proved worth in the prevention of insect attack and decay with a very novel method of securing the desired penetration of the compounds into the wood. The treating material was a compound of sodium flouride, dinitrophenol, potassium bichromate and gum arabic, known by the trade name of "Osmotite".

Introduction of the compound into the wood is obtained by the natural phenomena known as osmosis, "the mixing of two liquids by passage through a separating membrane". The moisture in the pole is utilized as the vehicle for carrying the preservative into the wood. It is interesting to note that without moisture there is no decay and standing poles with but few exceptions, contain moisture at the ground line and it is with this moisture as a medium that the preservative compounds are carried into the wood to prevent decay.

The actual treatment was simple. A hole about eighteen inches deep was dug around the pole. Increment borings were then taken to ascertain the internal condition. From all poles that warranted treatment the outer decay was removed with a small hatchet, the preservative compound in paste form was then applied by hand with a brush over an area about 12 inches above and 12 inches below the ground line. The treated area was covered with a waterproof bandage, wound spirally, starting from the top, around the pole. This bandage was held securely with tacks at top and bottom. The holes were then backfilled.

● The first applications were made on August 4th, 1935. Six weeks later, on September 28, 1935, increment borings were taken from four of the treated poles. The borings were subjected to color reagents to test the depth of penetration of the preservative compounds. The results of these tests are given in the following table.

Pole No.	Dinitro Zone (Protective Agent)	Sodium Flouride (Internal Preservative)
59	3/8"	1½"
60	¾"	2"
60	½"	1"
62	¼"	1½"

The tests made on increment borings indicated that very good peteration was had in only six weeks time.

To secure a complete and accurate report on the depth of penetration, on December 10, 1935 a pole that was treated on August 4, 1935 was removed. Discs, one inch thick, were cut from this pole. Starting at the extreme butt, these discs were cut at eight inch intervals. Of these discs, three were from the area over which the preservative compounds had been applied. The other five were from that part of the pole above and below the ground line.

The initial applications made by the New York State Electric and Gas Corp. were supervised by one of the field engineers of the Osmose Corp. of America. This company also supplied the preservative materials. The work carried out by the New York State Electric and Gas Corp. at Lancaster was done under the direction of L. K. Brown, of the E. M. Gilbert Engineering Corp.

Nebraska Convention Indicates Better Times

● The attendance at conventions of state telephone asociations is always a good business barometer of the telephone industry—always a good indicator of the feeling of those making up the industry.

The annual convention of the Nebraska State Telephone Association followed the trend of other state conventions this year by attracting a big attendance and indicated that the telephone business in that section of the country is on the upgrade.

The convention held February 12-13 at Hastings was opened by President D. C. McGregor. He gave his annual address in which he stressed the multitude of problems confronting the industry and made suggestions to aid in the regaining of the telephones lost during the depression.

Mark T. Caster, general plant superintendent, Lincoln Telephone and Telepraph Co., discussed the problems presented to the industry by the rural electrification program of the federal government.

● Explanation of the plan to secure reductions in fire insurance rates for rural telephone subscribers was given by C. C. Deering, secretary of the Iowa and National Telephone Associations.

"Safety Aspects of Telephone Work" was the subject of an interesting address by G. E. Battey, safety supervisor, Northwestern Bell Telephone Co.

Thomas C. Woods, vice-president, Lincoln Telephone and Telegraph Co., gave an explanation of the National Security Act, in the place of W. I. Aitken, who was unable to be present.

The work of the Nebraska Public Power Irrigation District was explained in an address by D. W. Kingsley, president of the project.

O. W. Johnson, district commercial manager, Northwestern Bell Telephone Co., spoke on the prospects for business in 1936. He emphasized the importance of and methods employed in telephone sales campaigns.

● Three women employees of the Lincoln Telephone and Telegraph Co., demonstrated the right and wrong methods of using the voice over the telephone. Enunciation, inflection and tone were cited as three of the most important factors, to consider in attaining perfect reproduction of the voice.

A round table discussion on engineering, commercial and business subjects was held under the direction of A. B. Clark, general manager, Continental Telephone Co., Columbus.

The following were re-elected as directors of the association: George E. Becker, Pawnee City, and W. R. Johnson of Omaha; and the substitution of H. F. McCulla, Lincoln, for W. E. Bell, Lincoln, who retired from active work recently.

The directors then re-elected D. E. McGregor, Gibbon, president, and B. G. Miller, Crete, as vice-president. The offices and duties of secretary and treasurer were combined and Secretary George M. Kloidy was elected to fill that position.

Power Line Burns Telephone Wires

When a Cape & Vineyard Electric Co., power line carrying 2,300 volts fell across a number of telephone wires at Harwichport, Mass., recently, it burned them out, shutting off all communication with Chatham and Harwich and causing a pile of damage to the telephone service.

A. T. & T. Income Shows Upturn in 1935

The American Telephone and Telegraph Co. reported to its 657,000 stockholders that net income of the Bell system applicable to their stock in 1935 amounted to $132,794,782, or $7.11 a share on the 18,662,275 shares outstanding. This compares with $111,167,554, or $5.96 a share in 1934. Income last year lacked $35,165,693 of meeting the $9 annual dividend rate, the difference being paid from surplus.

Operating revenues of the system last year were $934,370,872, compared with $884,532,429 in 1934. Operating expenses rose from $616,052,255 to $651,429,009. Taxes increased from $89,485,361 to $95,923,952. Other earnings rose from $3,918,967 to $12,893,670. Interest deductions shrank from $57,560,994 to $52,372,527.

"As a result of legislation passed in 1935," said President Walter S. Gifford, "federal taxes alone will be increased in 1936, without considerating the effect of any change in payroll or earnings, by about $9,000,000, of which some $4,000,000 is the new tax for unemployment compensation."

He added that last year's taxes were at the rate of $7.06 per telephone in service.

The sharp increase in "other earnings" resulted largely from improvement shown by the Western Electric Co. 99½ per cent of whose stock is owned by A. T. & T. Western Electric had a $2,620,279 profit last year and a $751,548 deficit in 1934.

Total assets of the Bell system were $5,059,352,366 on Dec. 31, 1935, compared with $4,977,054,686 at the end of 1934. Current assets rose to $408,350,421 from $393,120,762.

Cash assets alone amounted to $267,840,302, compared with $255,326,204 a year previously. Current and accrued liabilities were $181,637,053, compared with $179,596,036 at the previous year end.

Investments in the telephone plant aggregated $4,266,584,160, compared with $4,248,186,253 at the end of 1934.

Mr. Gifford also referred to the $750,000 investigation of A. T. & T. by the Federal Communications Commission.

"Clearly, the public is entitled to fullest information as to how affairs of the system are conducted," he said. "However, such investigations are costly both to the investigator and the investigated, and they inevitably interfere more or less with the normal day-to-day work so essential to satisfactory business performance. Every effort is being made to facilitate the progress of the present investigation in order that it may be completed as promptly as practicable."

Long dependable life is built into the Manchester positive plate of the Exide Chloride Battery.

Dependability

is a "built-in" quality characteristic of every Exide Chloride Battery

In modern telephone service Exide Batteries assure absolute dependability. They deliver power when needed most—*in emergencies.* Furthermore, their operation in common service is not affected by interruptions or fluctuations in the A.C. circuits. There is an Exide Battery for every telephone job whether it is common service, emergency reserve, signalling or P. B. X. Whenever dependability, long life and freedom from care are the determining factors for selecting a telephone battery, Exides are invariably chosen.

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FOR EVERY TELEPHONE USE

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

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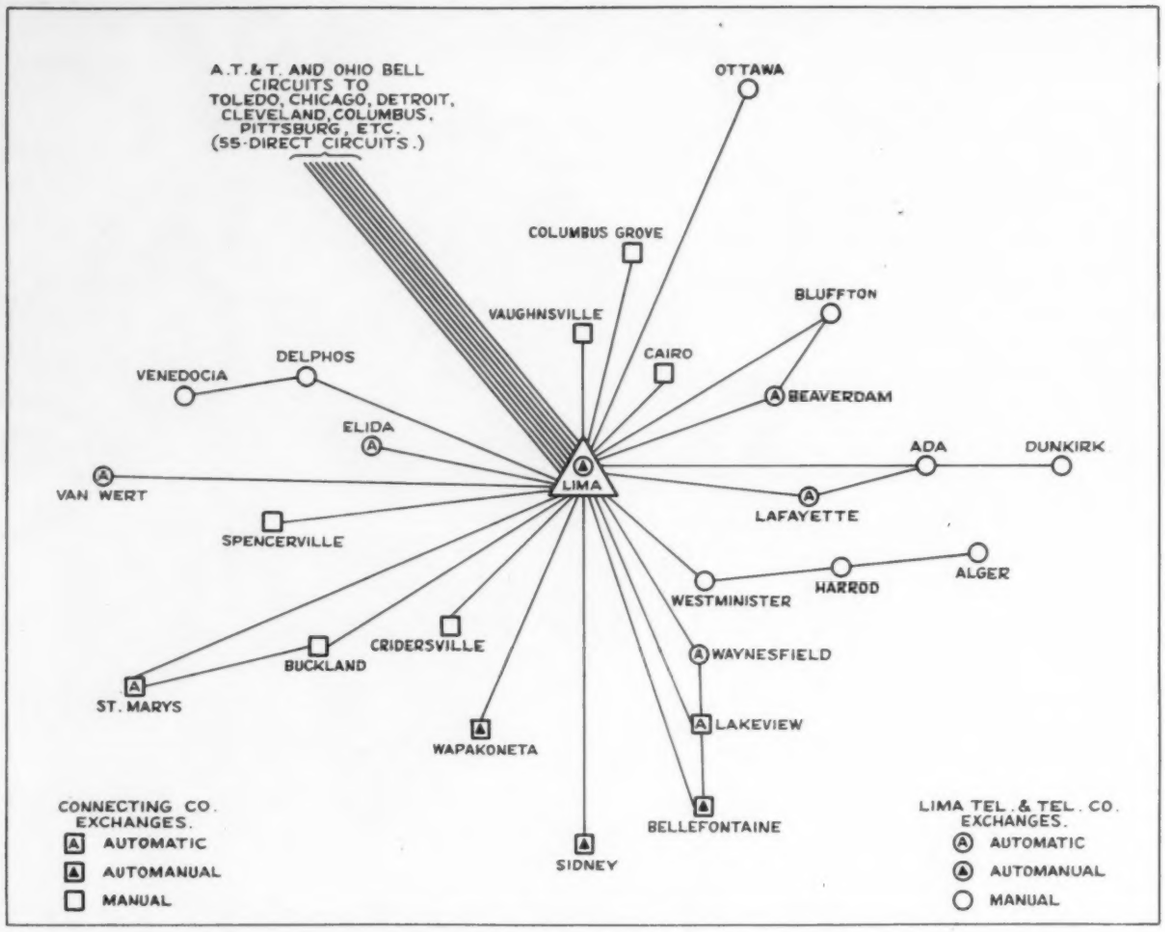


Lima interurban toll network showing a few of the 140 direct toll circuits which terminate on Lima automanual toll board.

All-Relay Toll Board at Lima, O.

By GEORGE B. QUATMAN
President, Lima Tel. & Tel. Co.

● One of the modern trends in the operation of telephone properties is the concentration of maintenance and operating personnel at the fewest possible number of points. The application of this general plan is one solution for the problem of the operation of the smaller telephone exchange units.

The centralization of maintenance and construction personnel has many advantages. Fewer stock or supply rooms are necessary, thus making it easier to keep up inventory and making larger purchases at more infrequent intervals possible. It encourages a close supervision of all maintenance and construction work and is an aid to large scale planning.

The centralization of operating personnel offers even more striking advantages. Carried to its fullest extent the plan involves the centralization of operators, the local connections being established by automatic equipment.

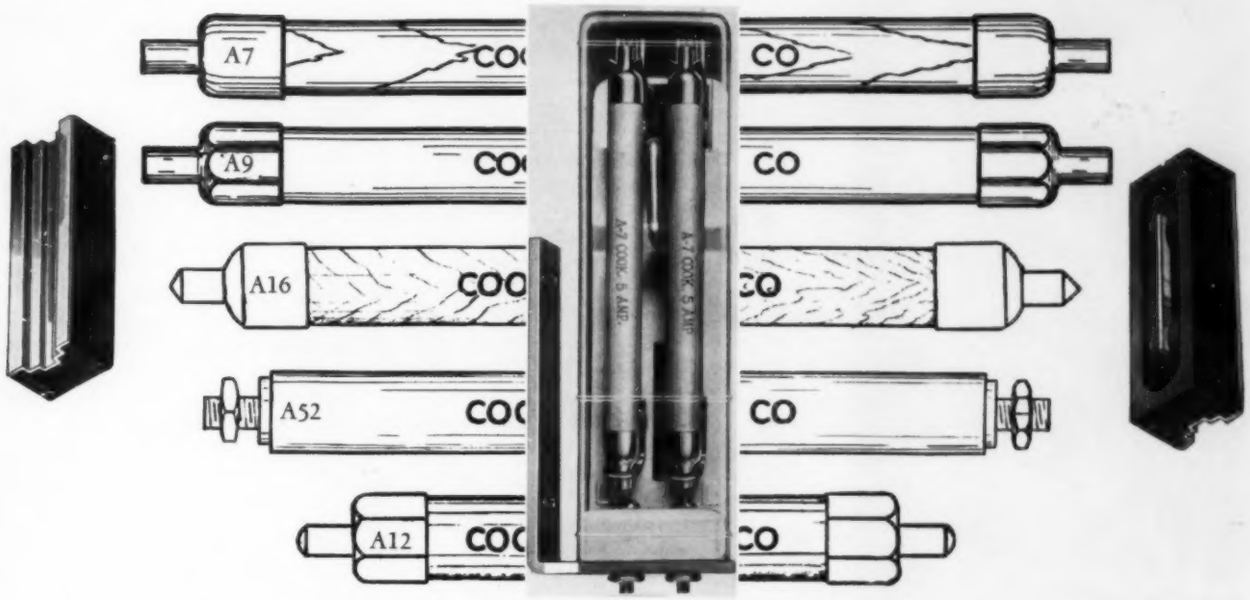
● Information and long distance still require the services of an operator. However, the operating personnel required to provide these special services may be concentrated at one or two strategic points in each county. Rapid toll service can thus be rendered because the toll operators may be given a more intensive training in the handling of long distance and the various ticketing operations. The information service can be made very complete and highly specialized in its functions. Exceedingly close supervision is possible and the entire service may be kept up to the very highest of standards. Secretarial service may also be supplied.

This service is highly satisfactory from the subscriber's point of view since the local connections are established in a rapid and efficient manner and when special services are required he is able to command the personal attention of a highly specialized staff of operators, with special equipment

(Please turn to page 36)

George B. Quatiman

O TYPE SUB-STATION PROTECTION



Actual size of fuses used in Cook 0 type. An indoor or outdoor sub-station protector. The protector that is fully enclosed, weatherproof and fireproof. The protector that provides protection without grounding the line because it is equipped with Cook True Gap Dischargers.

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For your protection specify Cook

Diagonals that CUT!

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No. 87

THE ELECTRICAL worker who uses a pair of Vacuum Grip Pliers for the first time knows that he is holding a pair of real cutters in his fist! The perfectly matched hand-filed cutting blades make a CLEAN CUT — they don't "mash" or "chew" the wire. And the rugged construction of the head and joint keeps them in alignment.

For durability and long life Vacuum Grip Diagonals are in a class by themselves. Hammer-forged from our own electric furnace tool steel formula, alloy tool steel, hardened and oil-tempered right through to the center — not case hardened (surface hardened).

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FOR ALL HEAVY DUTY WORK

No. 87 — 7" — $2.50 No. 86 — 6" — $2.00
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Vacuum Grip Pliers

BUILT UP TO A STANDARD — NOT DOWN TO A PRICE

OVER A MILLION IN USE

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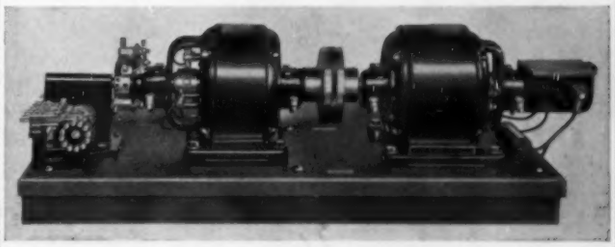

RINGING MOTOR GENERATOR SET

It is of vital importance that a telephone exchange operate dependably without interruption, AT ALL TIMES.

This is why Holtzer-Cabot ringing motor generators are designed and built to give a lifetime of continuous and dependable service.

Holtzer-Cabot ringing motor generator equipment has the unqualified approval of the engineering and service departments of all major telephone companies.

Our engineers will gladly confer with you. Their experience can be helpful — write Dept. 22 for descriptive bulletin.

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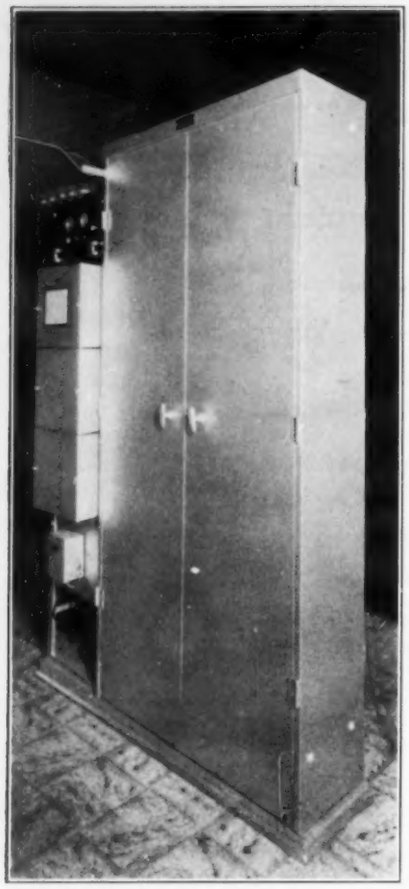
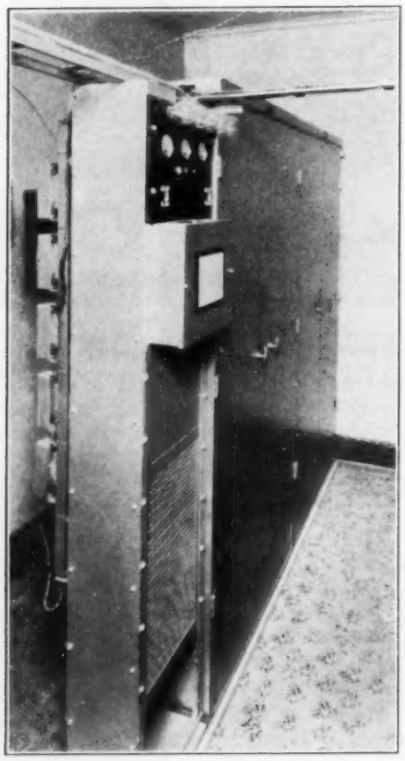
MOTOR SPECIALISTS

All-Relay Toll Board at Lima, O.

(Continued from page 34)



New North all-relay dial automatic unit at Waynesfield



Interior view of unattended automatic exchange showing the North all-relay equipment at Beaverdam.

and a larger number of circuits at the operator's command.

Under this plan the small outlying exchanges are operated as unattended automatic exchanges and the maintenance and operating personnel concentrated at the nearest large center. A small maintenance force located at a central point can keep a large number of unattended automatic central offices operating in first class condition. One switchboard man can take care of 15 small automatic plants.

● Many companies have now reached the stage in their programs of centralization where all of the local connections are established by means of automatic equipment. However, there is still a further step that can be taken in this direction and that is the introduction of automatic equipment into the handling of toll connections.

The handling of toll connections in the field in general has not kept pace with the use of automatic equipment for local operation. Most of the toll boards in use today are exactly as they were built 25 or 30 years ago.

The advantages to be gained by the introduction of automatic switching equipment into the establishment of toll connections, while not so obvious are as attractive as in the case of local operation. As an example of what has been done along these lines by an Independent operating company, the Lima Telephone and Telegraph Company's automanual toll board should be of considerable interest to the telephone field.

● The initial steps in the installation of the Lima all-relay interurban toll board were taken in 1928. The writer conferred with R. C. Arter, chief engineer, North Electric Mfg. Co., and a plan for the interurban total network was drawn up. This system has been added to from time to time until today it is said to be one of the largest in the country.

The original network consisted of the three cities of Lima, Wapakoneta and Bellefontaine. These cities all use the North automanual system for the establishment of their local connections. The Lima Telephone and Telegraph Co. serves about 10,000 stations, the Wapakoneta exchange operated by the Wapakoneta Telephone Service Co., serves about 1,500 stations, while the Bellefontaine exchange, operated by United Telephone Co., serves about 2,500 stations. Several of the smaller exchanges associated with these companies are also included in the network. At the present time there are 10 local automatic exchange areas being served by the Lima interurban toll board. The Lima Telephone and Telegraph Co.'s new automatic switchboards installed during the past year at Waynesfield and Beaverdam are the most recent additions to the system. The United Telephone Co.'s Lakeview exchange is now in production and will be converted to automatic operation at an early date.

The Lima Interurban toll board is said to be the largest all-relay automatic toll board in the world. It serves approximately 16,000 stations and establishes connections to 140 toll lines.

● In addition to the numerous local circuits, many of the long line circuits

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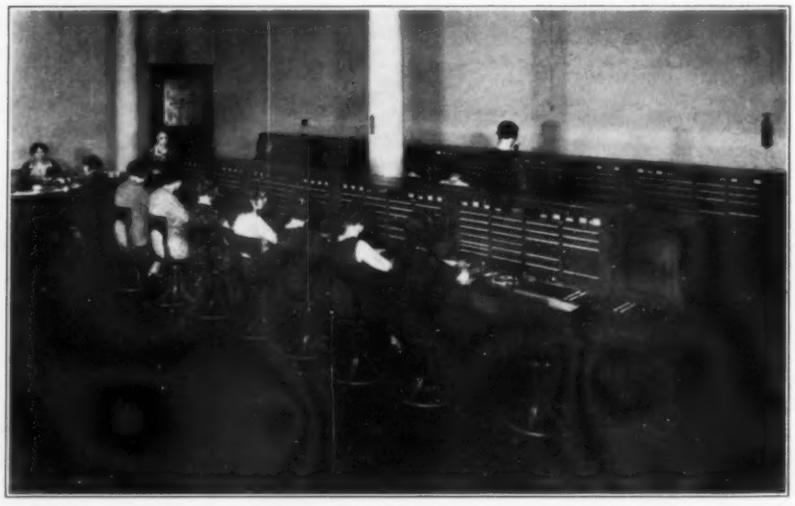

16-position Lima automatic toll board serving approximately 16,000 stations and establishing connections to 140 direct toll circuits.

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Novel design features simplify installation of jumpers.

The rigid zinc cover is insulated and can be fastened to the base.

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Besides this, still further improvement has been effected by laying the conductors flat instead of twisting them together in the usual way—a construction which virtually eliminates kinking. Insulation resistance also has been materially increased by means of a specially-developed process of impregnation.

Here at last in the PHILLIPS cord, is a better cord for every telephone use—one that you are urged to try at your earliest convenience. To order, merely specify number of conductors, length of trim desired. Prices gladly quoted upon request.

●

PHILLIPS PRODUCTS INCLUDE: Bare and Insulated Copper Wires—Rubber Insulated Wires—Enameled Wires—Magnet Wire—Power Cables—Switchboard Cables—Paper Insulated Cables—Flexible Cords—Electrolytic Copper Rods, Shapes, etc.

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● Klein Pliers are made for the man who needs or appreciates a remarkably fine tool.

From the careful inspection of the alloy tool steel made to the most exacting specifications—

Through the old craftsman methods of individual manufacturing and individual heat treating—

To the final steps of rigid inspection and testing, each pair of pliers that carries the Klein trademark represents the maximum in plier quality.

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On the other hand, for a man who demands a plier of Klein quality there is no way to produce it except the Klein way.

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RAMBLEGRAPHS

By J. A. Smith

Rambler and family arrived in Texas some time ahead of the annual convention of telephone men. But he did not arrive ahead of the epidemic of flu, mumps and a number of other ailments so prevalent in this section of the country. Nor did the family fail to "catch" the prevailing diseases.

• ● •

Between politics and the arguments for and against the street parking meters found in some of the cities and threatened in others, there is plenty to listen to. Some predictions are heard that Texas will again "disgrace" the solid south by voting republican, but this is very doubtful. The parking meter is another opportunity for politicians to raise additional funds and seems to be here to stay. However, a number of good points can be seen in favor of the idea.

The many friends of T. P. Bearden, general manager of the Home Telephone & Electric Co. of Baird, will be pleased to learn that he is showing some improvement in his fight to regain his health. He has been sick for some time but is now able to perform some of the duties of his position. Bearden is a hard worker and Rambler, who has been a close friend of this sturdy Texan for many years, wishes him a speedy recovery.

• ● •

It is reported that a few telephone exchanges in Texas formerly owned by syndicates, have been resold to private individuals. This is good news to the Independent industry and to the manufacturers supplying these exchanges. May their tribe increase.

• ● •

F. E. Shoup, assistant general manager of the Dallas Telephone Co. is able to be out again after several months' confinement at his home. Shoup is a pioneer in telephone circles and had earned retirement last July but decided to continue his activities, but was striken during that month.

• ● •

Texas is reporting a number of exchanges with more stations than at any point in their history. These are confined to Southwestern Bell cities, as far as we know.

• ● •

Conditions throughout the state of Texas are reported as satisfactory and further improvements are predicted for 1936-37. With good crop prospects and favorable prices this state should be back near the good-times period of six or seven years ago, at an early date.

• ● •

Fort Worth has a new artificial lake comprising one of the largest bodies of water in the state. Fine homes are being built along the water front. Rambler visited one of these new fifty thousand dollar homes along a rural line telephone property and talked with the builders. When told that modern telephones were now available to suit the decorations and surroundings the parties indicated immediate interest. Literature was promised showing the designs of modern instruments; they happen to need the ringing magneto type. We shall watch the reaction of this progressive builder.

• ● •

From the looks of telephone lines in many places along the highways to Texas it seems that the pole dealers might do a good business with the proper selling facilities. Improvements in other lines along the highways indicate that if the telephone man is getting an even break he, too, could spend something to better his service without fear of the bankruptcy courts.

• ● •

With hotels and apartment buildings pretty well filled at this time, people down in Texas are wondering what will be done about taking care of centennial visitors when they come down this summer and fall. The problem of housing the people in different cities is already becoming a big one, due to increased activities in all lines of business.

• ● •

(These paragraphs were written prior to convening of Texas convention in order to make the March issue.)

Gives Telegraph Service

The Kansas State Telephone Co., has assumed the business of Western Union in Baxter Springs and other Cherokee county towns served by the company. Automatic machines have been installed and the telegraph bills will be submitted with the regular telephone bills.

Overseas telephone circuits of the American Telephone and Telegraph Co., connect with many foreign telephone systems, but in none of these countries does the A. T. & T. own or operate a telephone exchange.

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• COFFING Hoists meet every requirement around telephone plants. They are Light, Compact, Powerful, and easy to handle in any position. Linemen find them invaluable for pulling guys, messengers, underground cables, etc. Capacities: ¾, 1½, 3, and 6 ton. Weights: 14, 25, 34, and 65 lbs.

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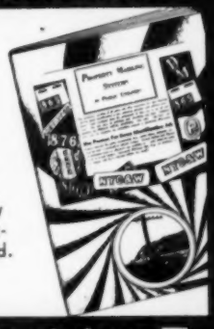

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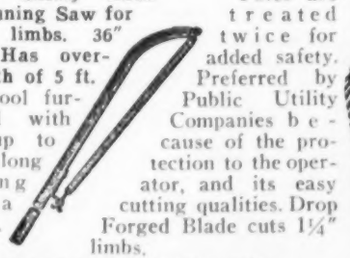
PREMAX SALES DIVISION, Chisholm-Ryder Co., Inc., Niagara Falls, N.Y.

BARTLETT NO. 1-W COMPOUND LEVER TREE TRIMMERS — ROPE PULL

No. 50 Safety Back Pole Pruning Saw for large limbs. 36" Blade. Has overall length of 5 ft. Either tool furnished with poles up to 16 ft. long by using extra sections.



Poles are treated twice for added safety. Preferred by Public Utility Companies because of the protection to the operator, and its easy cutting qualities. Drop Forged Blade cuts 1¼" limbs.

BARTLETT MFG. CO.
3032 E. Grand Blvd. Detroit, Mich.

60,000
electrical items for every Telephone Need

In these days when everyone is looking for purchasing economies, Graybar's service of supplies makes economies possible . . . It brings 60,000 electrical items within arm's reach of the telephone user. Does away with "shopping" around. Eliminates expensive stocks ... The natural result of Graybar's long experience in meeting the special needs of the telephone industry—an experience that goes back to the beginnings of that industry in America.

GraybaR

OFFICES IN 78 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., N. Y.

All-Relay Toll-Board at Lima, O.

(Continued from page 36)

of the A. T. & T. Co. and the Ohio Bell Telephone Co. terminate on the Lima automanual toll board. Among the cities to which direct line connections are available are: Cleveland, Celina, Columbus, Chicago, Cincinnati, Canton, Dayton, Detroit, Fort Wayne, Findlay, Indianapolis, Kenton, Marion, Mansfield, Napoleon, Piqua, Pittsburgh, Springfield and Toledo.

The subscribers in the Interurban toll area calling for long distance connections are instantly routed to the all-relay toll board where they may be connected to any other automatic area without the intervention of another operator. Should the subscriber desire a connection that involves the long line system, he may be connected to that system instantly by the depression of the proper selection buttons.

The service given by the interurban toll board is very satisfactory from the suburban subscriber's point of view as they receive in addition to their local service, direct city service equal in every respect to that available in the city itself. In the manual exchanges still remaining in the network the subscribers also are provided with direct service to the subscribers of the Lima automanual exchange without having to be routed through the long distance toll board.

The all-relay automatic toll board does not employ the use of any cords, plugs, packs, or mechanical switches. Each operating position contains a set of selection buttons, which very closely resembles an adding machine keyboard. The operator obtains the desired connections by operating the selection buttons.

● The toll conversations do not pass through the operators' positions. The equipment in these desks is used only for listening and supervisory purposes. The actual switching connections are made in the switchroom by means of the all-relay equipment. In this way we have found the transmission losses on toll conversations due to central office equipment are reduced to practically zero.

The Lima all-relay automatic toll board is divided into four classifications: Four positions for inward and through traffic, eight outward or combined line and recording positions, two information and ticketing positions, and two tributory positions.

Traffic is automatically distributed among the various positions. The selection of idle toll lines, when not directly made by the operation of the subscribers dial is performed instantly by the toll operator without any stepping equipment.

General view of equipment room at Lima showing a part of the 8,000 lines of automatic local switching equipment.

The board is equipped to give first aid recording trunk service. When a subscriber calls long distance, the call lights a white light in front of every operator. Associated with this light is a button. If all operators are busy the call is given first aid by an operator or supervisor who will press the button and say "Long Distance, one moment please", all the white lights then change to green so all operators know first aid has been given to that call and it will be served first.

● We have found that the automanual toll board equipment has greatly decreased the answering response time interval, as a general rule the average answering time for the Lima toll board runs from 2.5 to 3.0 seconds per call.

The operators are able to identify established connections by means of identity lamps that light when the link key is operated. The supervisory signals associated with the connecting links indicate the class of connection established so that the operator's attention is given only to the calls in which she is interested. Either end individually or both ends of the connection may be released instantly by the depression of a single button.

The use of the all-relay automatic toll board increases the scope of the toll operators enabling them to easily handle the complete toll service for several exchanges. He have found this type of equipment of value in areas that the converted to automatic local operation. It also results in quick completion of calls with a minimum of mental and physical fatigue to the operators and an average increase of about 35 per cent in the amount of connection handled per operator hour. Only eight outward operators' positions and four inward and thorough operator's positions are required under automatic operation.

Association Studying Teletype Practiced

● The United States Independent Telephone Association's general committee on Bell System special services procedure held its first meeting in Chicago, February 28. This committee was appointed on January 2 to study practices of the Bell companies in connection with teletypewriter, timed-wire services, etc., with special attention to compensation being paid Independent companies for their part in handling special services.

In order that the committee should be representative of all parts of the country, it was decided to appoint a member from each of the Bell subsidiary operating territories, as well as a group of members "at large". The committee is as follows:

Louis Pitcher, Dixon, Ill., Chairman:

J. H. Agee, Lincoln Neb.; Samuel Tucker, Pleasantown, Kan.; Wm. C. Henry, Bellevue, O.; W. N. McAnge, Bristol, Tenn.; E. R. Hannibal, Everett, Wash.; A. Wardman, Whittier, Cal.; O. M. Vaughan, South Haven, Mich.; R. V. Achatz, Aurora, Ind.; W. F. Goodrich, LaCrosse, Wis.; J. P. Boylan, Rochester, N. Y.; H. E. Bradley, Harrisburg, Pa.; B. L. Fisher, Martinsville, Va.; R. A. Lumpkin, Mattoon, Ill.

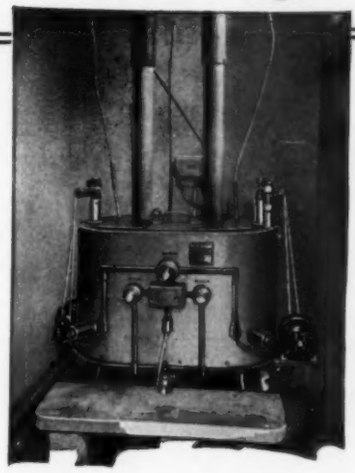
Members at large are: J. E. Albert, Columbus, O.; J. G. Crane, Kansas City, Mo.; J. B. Haley, Kansas City, Kan.; Gustav Hirsch, Columbus, O.; Lon Jester, Chicago and E. G. Waters, Chicago.

The association had sent to all of its members a questionnaire asking for their experience in teletype and other special services. Answers to these questionnaires had been carefully tabulated and were submitted to the committee. Also, a special analysis had been made of filing practices of the Illinois Bell territory as illustrative of the Bell practices generally. This analysis showed rates filed for various classes of special services and the compensation being paid to the Independent companies, as well as locations of all teletypewriter installations.

After a discussion in detail of the various problems presented, the committee voted that a question should be submitted to the membership at large which would embody the committee's opinion on the basis for compensation to Independent companies for handling these special services. It was also agreed that the committee would hold its next meeting in June, and in the meantime the members of the committee would contact the association members in their territories to discuss the question submitted and the principles involved.

Some time was devoted at the meeting to the question of proper procedure to be followed in connection with making tariff filings with the F. C. C. It was thought the present procedure being followed by the Bell companies may be bringing before the F. C. C. local rates of "connecting carriers" who are not required to file rates with that commission. It was recommended that further discussions of this procedure should be had by the association's officers with American Telephone & Telegraph Co. officials, in an effort to arrange a different procedure in connection with certain classes of filings; all looking to close cooperation with the Bell companies in meeting the legal requirements of the Communications Act and with the F. C. C. in meeting all necessary requirements of the commission's tariff regulations.

Bomb Aged and Tested



WB

Telephone buyers who purchase wire on a cost per year basis will be interested in our "OXYGEN BOMB" aged wire, a reliable means in conjunction with physical tests, of approximating the life of rubber insulation. In the "OXYGEN BOMB" the Whitney Blake insulated conductor is subjected to oxygen at extremely high pressure for days at a temperature much higher than encountered in service.

Telephone Wire

RUBBER COVERED
COPPERWELD - BRONZE
COPPER
DROP - INSIDE and BRIDLE

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The Whitney Blake Co.
SOLE SELLING AGENTS IN U. S. A.
GraybaR
ELECTRIC COMPANY
FOREIGN DISTRIBUTORS: *International Standard Electric Corporation*, 67 Broad St., N. Y. C.

Telephone Engineer

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3 Years For $2

SUB-CYCLE
Years AHEAD of All Other Ringing Machines

This MASTER Ringing Machine Has
NO MOVING PARTS
NOTHING TO ADJUST
NO RADIO INTEREFERENCE
ABUNDANT POWER
And Is ECONOMICAL

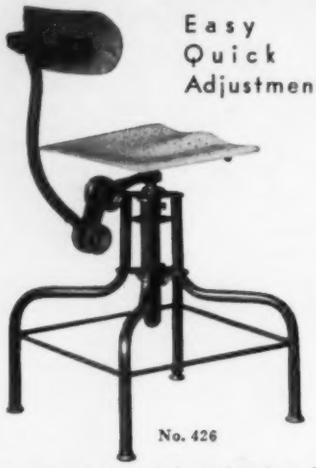
30 DAYS' FREE TRIAL
In Your Own Exchange
Operates on 110-115 volts A.C.
Price $45.00 F.O.B. Lorain
Lorain Products Corporation
LORAIN, OHIO
Ask Your Distributor

STURGIS

TRUE POSTURE

Operator Chairs

Easy
Quick
Adjustments



No. 426

A true posture chair designed to increase efficiency, mental alertness, reduce fatigue, improve the health and comfort of the operator.

Write For Particulars

Available in 3 Different Heights.

Distributed by

STROMBERG-CARLSON TELEPHONE MFG. CO.

100 Carlson Road, Rochester, New York

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STURGIS POSTURE CHAIR CO.

Sturgis, Mich.

50 Ways to Save Money

You will find complete description and flat prices on fifty different kinds of re-manufacturing jobs in our Suttle Salesman Catalog No. 39 which is probably laying around in your office. Each of these jobs shows you a way to save money by salvaging your old used equipment.

These Are Guaranteed Jobs

COMPLETE MAGNETO WALL COMPACTS, Made up from parts you send in, 10 lots,	**$7.75**
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DESK STANDS, Refinishing Job Only 10 lots,	**$1.00**
TRANSMITTERS, Complete Job, including nickel or black enamel finish, 50 lots,	**43¢**
RECEIVERS, You send defective core only and get complete receiver and cord like new, 25 lots,	**92¢**
HANDSET MAGNETO WALL TELEPHONES, You furnish generator, ringer, coil—we include new Leich handset, return complete phone, 5 lots,	**$13.45**
MAGNETO INDUCTION COILS, Rewinding, 5 lots,	**33¢**

See Suttle Catalog 39 for Details

Suttle Equipment Co.

LAWRENCEVILLE, ILLINOIS

Sao Paulo, Brazil, Orders Remote Control Board

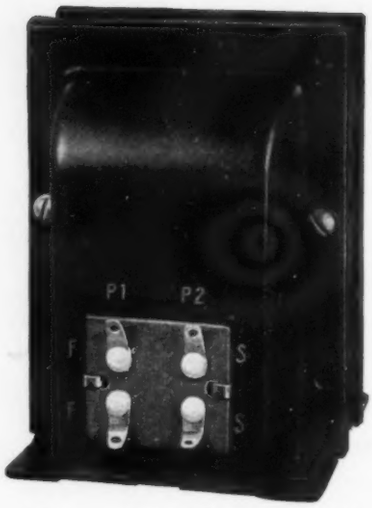
● The Companhia Telephonica Brasileira of Sao Paulo, Brazil, will soon install one of the largest automatic toll switchboards yet to be placed in operation. It will be of the Strowger remote control type and will consist initially of 40 positions.

This new "cordless" type of automatic toll switchboard was developed by Asosciated Electric Laboratories, Chicago, and several installations have been made in the United States. Like the latter the Sao Paulo installation will be engineered and manufactured by Automatic Electric Co., Chicago. Negotiations were completed by Automatic Electric Sales Co., Ltd., Chicago, exclusive export distributors for Automatic Electric Co.

In conjunction with the above switchboard, there are being supplied 14 positions of toll test panels, four directory and rate quoting positions, two service observing positions and one chief operator's position. Equipment will also be furnished for an 18-position information board of the Strowger remote control type, as well as voice frequency dialing equipment for 25 circuits between Sao Paulo and Rio de Janeiro.

Automatic Offers Central Battery Line Adapter

● A new and effective device for providing central battery service from magneto exchanges was recently announced by American Automatic Electric Sales Co., distributor for products of Automatic Electric Co., Chicago, the company announces. This device, known as the Autelco Central Battery Line Adapter, is essentially a compact transformer, of special patented design. Each line to be converted to central battery operation is equipped with an



Autelco central battery line adapter

adapter which is connected in the line circuit at the central office.

A 24 volt storage battery, connected through the primary windings of the adapters, provides the central battery current supply for all the central battery lines. Current induced in the secondary winding of the transformer serves to operate the drop signal when the telephone handset is removed from, or replaced on, the cradle. The adapter serves as a ring-through and talk-through repeating coil on incoming signals and on voice transmission. Any standard type of central battery telephones can be used.

● While operating companies are finding the greatest use for this adapter on individual lines, it may also be used on party lines serving up to 10 persons, it is said. It may be used on any full-metallic circuit, with an allowable loop resistance of 700 ohms, and using straight line or harmonic ringers. No changes are required in the switchboard, nor in those lines which are to be continued on a magneto basis.

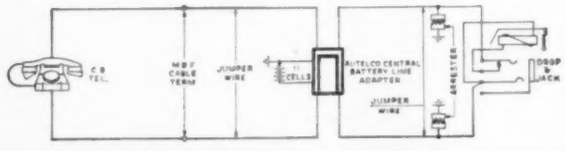


Diagram of Connections of Central Battery Line Adapter

TELERING

Only ONE Contact!

Price $44.00
F.O.B. factory

For better and cheaper ringing.

No Radio Interference

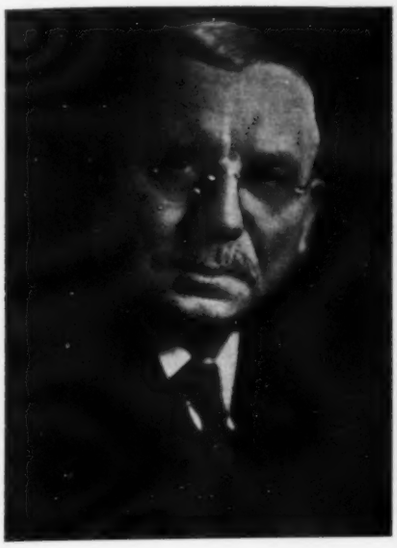
30-day free trial

TELKOR, Inc.
ELYRIA, OHIO

(See our space in next month's issue)

Joseph A. Klein Passes Away

Joseph A. Klein, president, Mathias Klein & Sons, Chicago, after a long illness, died on February 7.



Mr. Klein was the son of Mathias Klein, who founded Mathias Klein & Sons in 1857. As a boy he worked under his father's supervision, learning thoroughly the manufacture of fine tools, and when his father retired from business, Mr. Klein, together with his older brother, John, carried on the firm for some years as a partnership. In 1918 the firm was incorporated, and John Klein retired in 1925, Joseph Klein becoming president, which office he occupied until his death. He had continued the "quality first" policy of his father unchanged with the result that the business is now passed on to his two sons with an unquestionable reputation for integrity that has stood the test for 79 years through good times and bad.

In his passing the telephone industry loses an outstanding man and his life will stand as an example for those left who continue his work. He is mourned by his entire organization and by all who remember him as a loyal friend.

New Telephone Companies

Knightstown Telephone Company, Inc., Knightstown, Ind., resident agent, George Watts; capital stock, 300 shares of no par value; objects, to operate telephone plant in Knightstown, Kennard and other towns in Indiana. Incorporators, George Watts, Walter S. Garitson, Grace W. Reagan.

Farmers Co-operative Co., Dallas, Ia., no capital stock; J. A. Camerson, president, Lacona, Ia., H. D. Gehring, secretary, Lacona.

Crapo GALVANIZED PRODUCTS

Lower Maintenance Costs

Crapo Galvanized Telephone Wire and Steel Strand can be spliced and served without injury to the galvanizing. The heavy, uniform, *pure zinc* coating, applied by the *Crapo* Patented Process, is so adherent and so ductile that it defies sharp bending and twisting. This insures corrosion-resisting joints, adds to the life of the wire and actually reduces maintenance costs .... Specify genuine *Crapo* Galvanized Steel Strand and Telephone Wire for all new and replacement work! They more than meet the most rigid specifications. ....

Indiana Steel & Wire Company
Muncie, - Indiana

Crapo Galvanized Steel Strand is first choice of leading utilities both for guying and for messenger cable. Photo from Peoples Telephone Co., Butler, Pennsylvania.

Telephone Wire • • Steel Strand

Test The Shallcross Telephone Service Meter Before Purchasing

Measures:
6 to 300 Volts
A.C. or D.C.

D.C. Current
15 M.A. to
6 Amperes

Resistance
.5 to 50,000 ohms

Inductance,
Capacity and
Continuity

Incorporates a standard dry cell test and power level indicator. The instrument was developed by telephone men for the exchange man and trouble shooters. Will not become obsolete. Covers the fundamental tests; accurate, dependable and moderately priced.

Send for Bulletin 614-NB

SHALLCROSS MFG. COMPANY
COLLINGDALE, PENNA.

DAVEY LINE CLEARING SERVICE

THE ABILITY of Davey men to economically meet the rigid requirements of utility companies has boomed the volume of Davey line clearing business to a new high.

Through careful planning and the use of a specially picked and trained personnel, the quality of the work has been preserved and improved, while costs have done a nose-dive. Better investigate this for your own company.

THE DAVEY TREE EXPERT CO., Kent, Ohio

DAVEY
TREE SURGEONS

The Clearing House

For the convenience of readers of Telephone Engineer

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HERDRICH AND BOGGS
Certified Public Accountants
Specializing in Telephone Accounting and Rate Cases Since 1918.
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22 years continuous contact with telephone organizations.

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LITTELFUSES

- INSTRUMENT LITTELFUSES, for meters, 1/200 amp. up.
- HI-VOLT. LITTELFUSES for transmitters, etc., 1,000 5,000, & 10,000 volt ranges, 1/16 amp. up.
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- AIRCRAFT FUSES, AUTO FUSES, RADIO FUSES, FUSE MOUNTINGS, etc. Get new Cat. 6.

Littelfuse Labs., 4238 Lincoln Ave., Chicago

Lightning Arresters

L. S. BRACH Mfg. Corp., Newark, N. J.

NEON ARRESTER UNIT
Replaces Carbon Mica
Avoid Grounds or Leaks

SOLDERALL
Pure Metal Solder and Flux Combined
In Collapsible Tube

TEST-O-LITE
Pocket Voltage Tester—100 to 500 Volts
Indicates AC or DC and Polarity

WRITE FOR BRACH CATALOGUE

Test Sets

FOR CABLE TROUBLE

The Canty Fault Finder locates wet cable, shorts, crosses, grounds. The Telephone man's friend. Price $12.50 postpaid.

Canty Cable Machine Co.
HOPKINS, MO.

Seymour Smith Has New Tree Pruner

Seymour Smith & Son, Inc., Oakville, Conn., has announced to the telephone industry its new No. 11 Telephone Tree Pruner.

No. 11 Tree Pruner

The company claims the following features for the new pruner: "center cut" construction; safety catch to lock blade in closed position; one piece tempered tool steel blade; reinforced non-clog hook; high quality chain; large welded ring and unbreakable malleable iron head.

The No. 11 Pruner is 10 inches overall and weighs 1¼ pounds. The Seymour Smith company recently issued a folder describing and illustrating its line of products including pruner pole adapters and pole pruner saws.

New Telephone Companies

Danevang Telephone Company, Danevang, Tex.; capital stock $3,000. Incorporators: C. M. Hansen, Hans T. Anderson and H. J. Berndt.

Myrtle Beach Telephone Co., Georgetown and Harry counties, S. C.; P. O. adress, Georgetown; to operate a telephone system; capital stock, $15,000; officers, R. M. Barnes, president; L. Marion Jordan, vice-president; A. G. Ternholm, secretary and treasurer.

Poles

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CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
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Finished Cedar Poles
VALENTINE CLARK CORPORATION
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Write or telephone for proposition
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Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
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For the convenience of readers of Telephone Engineer

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SPECIALISTS IN
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TRANSMITTERS

Absolutely finest workmanship guaranteed

Baked, black, velvet finish, New granular carbon. Workmanship, adjustments and tests made with the latest and most improved apparatus. 50c each less backs. One year money back guarantee.

Full information on request

THIS MONTH'S SPECIAL

Cable Terminals

Rebuilt Like New

W. E. unprotected 16 pair, less stub	$2.75
with 5 ft. stub	4.75
W. E. unprotected 10 pair with 5 ft. stub	4.25
Reliable 16 pair, unprotected, less stub	2.50
Main Frame Terminal blocks, W. E. No. 38, 20 or 25 pair	1.00
NEW BAKELITE Mouth pieces for W. E. transmitters	$500 per C.
For Automatic transmitters	5.50 per C.

Telephone Repair Shop

Rogers Park Station Chicago

Operated by Daniel H. McNulty

RECONSTRUCTED EQUIPMENT

New Kellogg Grabaphone with New cabinet inside connection Kellogg equipment 3-bar 1000-1600 or 2500 ohm ringer signal set @ $13.00—4-bar @ $14.50—5-bar @ $15.50

Kellogg No. 84 desk set with Kellogg Trans. & Rec. Complete with New cabinet 3-bar 1000-1600 or 2500 ohm ringer Kellogg equip. inside connection signal set @ 9.50

Kellogg New Magneto or C. B. Grabaphone complete with 3 conductor cord less signal set @ 7.25

Western Elec. No. 48A 5-bar Generators complete with Cranks and Screws @ 4.25

Kellogg No. 79 Common battery Ind. Coils @ ..... .45

Western Elec. No. 143 Receiver with repolished shell and New cord @ 1.00

Western Elec. No. 50F Latest type 3-bar Gen. with Crank and Screws @ 1.90

Kellogg No. 41 Receiver with New Shell and Cord @ 1.25

Western Elec. No. 20 desk set with W. E. or Kellogg Trans. & Rec. complete with No. 240 3-bar 1000-1600 or 2500 ohm ringer external post signal set 8.50

Kellogg No. 631 C. B. Steel hotel sets with Straight line or 16-33-50 or 66 cycle ringers @ 5.50

Model No. 6 Style C Flush type Calculagraph spring driven Rebuilt and refinished with New ribbon @ 26.50

New Cook H No. 44 Wall type protector Rack complete with fuses and GG No. 10 cross connecting strip and mounting brackets per 20 line units @ 6.50

Write for Bulletin

REBUILT ELECTRIC EQUIPMENT CO.
1940 West 21st St., Pilsen Sta.
Chicago, Ill.

Owens-Illinois Captures Page One

For the first time in the history of the Owens-Illinois Glass Co., Toledo, the annual branch managers' meeting was this year converted into a meeting of all members of the company's sales staff on January 23, 24 and 25. The branch managers and salesmen from 25 offices, together with plant managers and assistants, from 250 men all told, met with company officials and witnessed an elaborate presentation of the company's sales program.

High point of the sales meeting came during the banquet tendered the sales staff on the evening of January 24. During the dinner there suddenly burst into the great ballroom of the Commodore Perry Hotel a gang of newsboys shouting startling news about Owens-Illinois and delivering to each diner a special edition of the Toledo *News-Bee*, bearing a streamer headline — "OWENS-ILLINOIS CAPTURES PAGE ONE." The special edition was a complete issue of this leading Toledo newspaper, with its entire front page and half its second page devoted to Owens-Illinois convention pictures and special news items about the company. In a box on the front page appeared a special editorial addressed to Owens-Illinois and signed by the editor of the paper.

Roberts Heads United of Pennsylvania

Election of A. J. Roberts as a director and president, and L. R. Thurston and G. E. Twigg as director of The United Telephone Co., of Pennsylvania was announced recently.

Roberts is a veteran of 34 years in the telephone field and has served the United Companies in an executive capacity since 1924.

Thurston entered the telephone industry with the Bell Telephone Co., of Pennsylvania in 1920. He transferred to The United Telephone Co. of Pennsylvania six years ago as general traffic manager.

Twigg has been general plant manager since the Fall of 1931. His entire telephone career, begun in 1907, has been with Independent telephone companies.

Telephone Equipment (Continued)

RECONDITIONED

Kellogg 3-conductor desk stands only, New Cords, Shells and caps, New felt on base, Complete with No. 41 rec. No. 22 L. or L. C. Transmitter. Refinished like new. $5.00 each.

Independent Telephone Repair Co.
1432 W. 15th Street, Chicago, Ill.

NEW MAGNETO SUBSCIBERS

Give your new Magneto Subscribers a modernized telephone of latest design, by paying only a small portion of the cost of a new telephone.

Send us the parts of your old telephone to be modernized into Desk Sets or Wall Compacts.

YOU SAVE THE DIFFERENCE. Write today asking for prices.

ALBERTSON ELECTRIC CO.
Telephone Division
3540-34 W. PIERCE ST.
MILWAUKEE, WISCONSIN

CORDS

72" 3 Cond. Desk Stand 30c each
36" Receiver Cords ..... 15c each
"Lifetime" cords—ex. heavy bronze tinsel. Send for cord chart and free samples.

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FRAMINGHAM, MASS.

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